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On the edge of the beech woods

TREES THAT EVERY CHILD SHOULD KNOW

EASY TREE STUDIES FOR ALL SEASONS OF THE YEAR

BY

JULIA ELLEN ROGERS

AUTHOR OF "THE TREE BOOK," "THE SHELL BOOK," "KEY TO THE NATURE LIBRARY"

ILLUSTRATED BY FORTY-SEVEN PAGES OF PHOTOGRAPHS

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TREES EVERY CHILD SHOULD KNOW

HOW TO KNOW THE TREES

THE best time to begin to study the trees is to-day! The place to begin is right where you are, provided there is a tree near enough, for a lesson about trees will be very dull unless there is a tree to look at, to ask questions of, and to get answers from. But suppose it is winter time, and the tree is bare. Then you have a chance to see the wonderful framework of trunk and branches, the way the twigs spread apart on the outer limbs, while the great boughs near the trunk are almost bare. Each branch is trying to hold its twigs out into the sunshine, and each twig is set with buds. When these buds open, and most of them send out leafy shoots, the tree will be a shady summerhouse with a thick, leafy roof that the sun cannot look through. Among the big branches near the trunk very few leaves will be found compared with the number the outer twigs bear.

How can we tell whether the tree is alive or dead in winter? Break off a twig. Is there a layer of green just inside the brown bark? This is the sign that the tree is alive. Dead twigs

are withered, and their buds are not plump and bright. The green is gone from under the bark of these twigs.

Under each bud is the scar of last year's leaf, and if you look on the ground you are pretty sure to find a dead leaf whose stem fits exactly into that scar. If there are a number of these leaves under the tree, you may feel sure that they fell from the tree last autumn. Look carefully among the leaves, and on the branches for the seeds of this tree. If there is an acorn left on the tree, you may be sure that you have the tree's name!

The name is the thing we wish first to know when we meet a stranger. If an acorn is found growing on a tree, that tree has given us its name, for trees that bear acorns are all oaks. An acorn is a kind of nut, and there are many kinds of oaks, each with its own acorn pattern, unlike that of other oaks. Yet all acorns sit in their little acorn cups, and we do not confuse them with nuts of other trees. So we know the family name of all trees whose fruits are acorns. They are all oaks, and there are fifty kinds in our own country, growing wild in American forests. But if those of all countries are counted, there are in all more than three hundred kinds.

If, instead of acorns, pods hang on the twigs,

the tree belongs to the locust family, related to our garden peas and beans. The signs by which we learn to know trees are not many. The bark of the white birch is so silky white that everybody knows that tree. The sycamore sheds its bark in thin, irregular sheets, leaving patches of dirty white streaking the trunk and limbs, as if the tree had been daubed and spattered with whitewash. This tree is so strikingly different from others that nearly everybody knows it by name. Or they call it " buttonwood." The seed-balls hang on slender stems, swinging in the winter wind.

The winter signs to notice are the bark, the buds, and the leaf scars, the shape of the tree, and the way it branches. The fruit it bears may be seen in summer, autumn, or winter. The flowers come in warm weather, some kinds early, some later, and the leaves are new in spring, and most trees shed them in autumn. There is no time of year when there are not three or four of the important signs hung out on every tree to guide those who are trying to find out its name, and learn the story of its interesting life. And the finding out of tree names is not dreary and hard, but a good game to be played out-of-doors.

TREE STUDIES IN THE AUTUMN

THE SHAGBARK HICKORIES

THE best hickory nut tree that grows wild in our American forests is the shagbark, or shellbark. Who says that the pecan is better than the nut of the little shagbark? Southern people insist upon this, as the pecan is the pride of the Southern states. As a compromise we may place side by side the pecan of the South, and the little shagbark of the North, and challenge the world to produce a nut that is worthy to rank with these two in quality.

The shagbark takes its name from the tree's habit of shedding the bark in long, narrow strips or flakes, that curl away from the point of attachment, but cling for months, perhaps, giving the trunk a shaggy appearance, and making very easy the discovery of these trees in a stretch of mixed woodland. And how it does cut and slash the stoutest of overalls to scramble up and down one of these trees? Only boys and their despairing mothers can know just how costly a Saturday afternoon nutting expedition can be, and why many a boy finds it expedient to come back with his bag of nuts in the late dusk.

Otherwise he might be mistaken for a tramp, so tattered are his clothes.

The smooth little nuts are angled and pointed, and when they are ripe, the thick, corky, green husks part into four equal divisions, and the nuts fall out. So much less trouble than walnuts, in their spongy husks, that never part regularly, but wait until they are torn off by impatient boys or squirrels, or until they dry and gradually crumble away.

The shagbark hickory is a beautiful tree when covered with its shining foliage in summer. Each leaf is made of five leaflets on a wiry leaf stem. The three outer leaflets are larger than the pair set nearest the base of the stem. The whole leaf is often more than a foot long, and sometimes there are seven leaflets on each.

The most wonderful shagbark hickory tree I ever saw was one I met once at sundown, after a long walk across country. It stood in a field, alone, and so near my home that I had noticed it almost every day through a long winter. I had gathered a quantity of nuts as they fell in the frosty autumn days, and it was a race between me and the squirrels, often, to see who should get the bigger share. I think they beat me, which is perfectly right. I remember now how rich the foliage looked as it slowly turned from green

to golden brown, and fell in a great windrow all about the shaggy trunk, as the nuts ripened.

All winter I noticed how strong the lithe limbs were, and how flexible, as the wind twisted them about in storms, and how much of promise there was in the great, scaly buds that tipped the twigs.

It was late April when I came by. As I looked up into that tree top the sunlight was shining through, and at first I thought I must be dreaming. Instead of buds, I saw what seemed like lighted candles, each with a silken frill, like the recurved petals of an iris, below the tip of flame! I had never seen a tree thus illuminated, and the sight was enchanting. The warm spring air had brought out the hickory buds, with those of other trees, and while I was looking for flowers on the ground, the buds above had swollen, cast off the winter covers, revealing the silky inner wrappings of the young shoots. The rich downward-curving "petals" were only the inner scales of the great buds, grown long and wide, their vivid orange setting off the compact yellow buds that still stood erect. These concealed the tender, velvety leaves that were soon to be revealed with the falling of the leaf scales. I had never seen a hickory tree opening its iris-like buds before, but I have never missed it since.

The big shellbark, or shagbark, hickory is the

sturdy "big brother" of the little shagbark. In every particular it exaggerates the characteristics of the favourite among our nut trees. The bark is more shaggy, the tree grows larger, the nuts are bigger. Are they *better?* No. But they are much the same in flavour, and being so good and so big, they have the market name of "king nuts." The best of them are gathered in the woods of Missouri and Arkansas. The tree is found from Pennsylvania westward to Oklahoma, but the lumber is valuable for the making of vehicles and tool handles, and so the trees are now scarce in the states that are oldest.

In winter the big shagbark trees show their orange-coloured twigs. They are peculiar to this one hickory. The leaf stems stay on the twigs after the leaves fall, and give the tree top in winter a ragged, hairy appearance, that matches its shaggy trunk.

THE DISAPPOINTING HICKORIES

The pignut has been given this ugly name because farmers, in the early days, turned their pigs into woodland pastures to fatten on the thin-shelled nuts that dropped from this kind of hickory tree. They are not bitter, but merely

tasteless, and it is only a "greenhorn" from town or city who will spend time to gather these poor hickory nuts, mistaking them for shellbarks. They are not usually angled, but smoothly rounded, often pear-shaped, and the husks are thin. The shagbarks are in husks nearly one-half inch thick, which split in four divisions, and fall apart to release the ripe nuts. The husks of pignuts divide but part way down, and so the nuts are not freed from them promptly. The kernels are yellowish white.

A look at the bark of a shagbark hickory, and then at a pignut fixes in mind one of the chief differences between these trees. The pignut has clean, smooth, grey bark, becoming coarser and rougher with increasing age, but never shedding its bark in ragged strips as the shagbark begins to do when the trees are still young. Smoother foliage and twigs, smaller buds in winter, and a more regular round head make the pignut a fine tree to plant on the lawn, where the shagbark would be out of place, on account of its shaggy, untidy trunk.

Another handsome hickory tree with nuts that are very disappointing to the members of a nutting party is the mockernut, called also the big bud hickory, and the white heart hickory. The last name is wrong because the heart wood is

brown, and it is the wood near the bark that is white. The tree has the largest buds and the stoutest, clumsiest twigs and branches in the whole hickory family. The leaves are correspondingly large, sometimes nearly two feet long, of seven to nine leaflets, on downy, swollen stalks. The catkins of the staminate flowers are like thick, chenille fringes, six inches long, often longer, hanging in May below the new leaves.

The nuts are large and look most promising at first. The big, four-parted husk is as thick as a shagbark's, but it does not split all the way down. So the first difficulty is to get the nut out of the husk. The bony shell is the next. It is astonishingly thick and hard to crack. Last disappointment of all, the kernel is at best very small, and not worth the trouble of getting it out, though there is no denying that it is better-tasting than a pignut, and almost as sweet as a little shagbark. Very often the shell contains a spongy substance that is tasteless, instead of the kernel the patient nutter has a right to expect.

Crumple leaflets of this tree in your hand, and they smell fruity, like an apple. They turn to yellow and russet in autumn.

The bitternut is a hickory nut whose kernel no squirrel eats. It is as bitter as gall. Thin-shelled as a pignut, and usually less than an inch

in length, the nuts are enclosed in thin husks, that differ from others in having thin ridges that rise along the four lines where they split at the time the nuts are ripe. Two of these clefts run farther down than the other pair. The nut shell is thin, slightly flattened sometimes, and marked with dark lines. The kernel is white, and you will never taste a second one.

The sure sign by which to tell the bitternut hickory is the tapering, flattened, yellow bud. At any time of year a few, at least, of these buds are to be found. They are numerous from midsummer till May; after that, a few dormant winter buds remain to tell the tree's name until the new buds are showing in the angles between leaf and twig. No other hickory has little, yellow buds.

In winter the slimness of the twigs, and in summer the small size of the leaflets make this the most delicately built of the hickories. The buds are the smallest to be found on a hickory tree. Yet it is the quickest to grow, and one of the handsomest trees in the family. Because it loves best to grow with its roots in wet soil, it is called the swamp hickory.

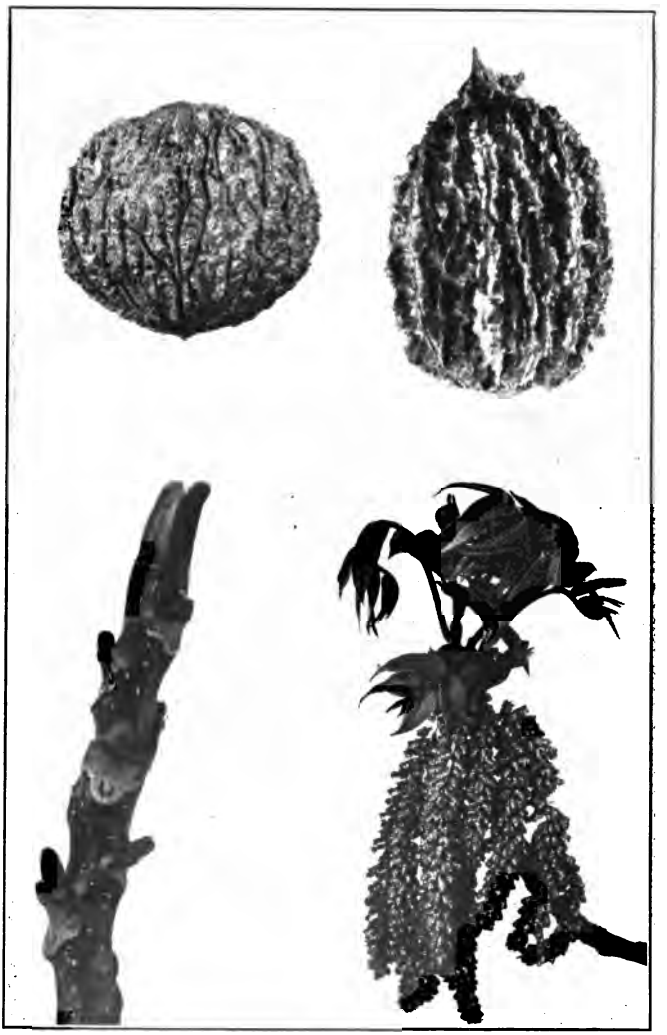
THE BLACK WALNUT

No boy or girl who has ever gone nutting "in brown October's woods" can forget the fruits of the black walnut trees that hang like green oranges, high up on the ends of the branches, and have to be climbed for and shaken down. And each fellow on the ground looks out for his own head, as the shower of nuts comes down. Oh! the rich, walnut smell of those juicy husks, as we bruised them on the nearest stone, tore them off, wiping our damp fingers on the grass, before cracking the rough-shelled nuts. The brown stains stayed until they wore off, but the memory of the sweet kernels lasts longer, and the pungent odour of those nut husks is in every twig, bud, and leaf of every walnut tree. Bruise any young shoot, and by the odour of its sap the tree's name may be guessed.

There is another test for a walnut tree, for those who do not know the odour of the sap. Cut a twig, and split it. The pith of walnut trees is not solid, but is in thin plates, separated by air spaces. This is a sure sign.

Walnut trees grow rapidly, and are a valuable tree crop to plant. Nuts for seed are packed in gravel, and left outdoors over winter. The stub-

Three pignuts, with husks, three shagbarks, and two pecans.
Flowering twig of the little shagbark hickory



Black walnut and butternut. Twig of butternut, in winter and in spring

born shells are cracked by Jack Frost in such a way as not to injure the seed, which is the meat of the nut. The nuts are planted in spring just where the trees are to stand, for it is much better for a walnut tree never to be transplanted.

I have heard my grandfather tell how the early settlers in Ohio cleared the rich bottom land along the rivers. The great trees that had grown, undisturbed, for centuries, were the "weeds" that had to be cut down and removed, before the soil could be ploughed and sowed to oats or wheat. The only way to do this was to burn the trees, by piling them together and firing the pile, as soon as it was dry enough to burn. The "log-rollings" were the neighbourhood gatherings, when men brought their teams and log chains, and worked like Trojans, dragging the logs to the places selected for the giant bonfires, later on. The women and children had a grand time, watching the men at work, and preparing the dinner, which was a feast, and a great social occasion.

The stump of many a noble black walnut tree, cut down a century ago, has stood, undecayed, until recent years. So valuable is its wood that these stumps have been pulled up with expensive machinery, for the gnarly-grained roots that are still sound. Cut into thin sheets, the wood is

used for veneering furniture. Think how many millions of dollars' worth of lumber went up in smoke in those bonfires! Black walnut is scarce now, and can hardly be bought at any price.

THE BUTTERNUT

The butternut trees are stripped of their fruit in October by boys who have visions of long evenings, such as Whittier describes in "Snow Bound," with nuts and apples and cider, by a roaring fire. Some boys leave the black walnut trees to others, and fill their bags entirely from the low, broad butternut trees, that have more nuts in each cluster, and they are not so hard to reach. Many will say that they are much sweeter and richer than black walnuts. Others do not care for them because they are so oily. Indeed, they are called "oil-nuts," and woe to the youngster who has eaten "all he wanted"!

The butternuts are oblong and pointed at one end, and sticky to the touch, differing in this particular from the globular fruits of the black walnut. The same clammy feeling makes it unpleasant to touch the leaves of butternut tree. The resinous sap seems to ooze out through pores along the hairy leaf veins.

In summer time, when the fuzzy, green butternuts are scarcely larger than olives, and their shells are so soft that a knitting-needle goes through without any trouble, the time for making pickled nuts has come. The gathering of the clustered green fruit is fun, but as soon as they are scalded, the "fur" has to be rubbed off of each, before the nuts, husks and all, are put down in spiced vinegar, to be used as a relish for serving with meats the following winter. The "furring" usually falls to the children, and they get very tired, for it is a slow and monotonous job, whether one uses a coarse towel or a brush. However, it would be unpleasant to eat a furry nut, no matter how carefully the spicing was done.

THE ENGLISH WALNUT

The English walnut trees are grown in orchards in Southern California. These trees are quick to grow, and come early into bearing. When you buy a pound of these thin-shelled nuts at the corner grocery store, you may well wonder where they grew. Perhaps little children picked them up under trees that grow in Italy or in Greece. Fine, large nuts come from France, but

none of them are raised in England. Many of the best nuts are raised in California, where more and more trees of this kind are planted each year. They grow in the Southern states, but have never been planted on a large scale as a commercial nut tree.

The English walnut tree grows in England, but the nuts never have time to get ripe in that climate. They are gathered green, and pickled, husks and all. From English grandmothers we learned to pickle our own butternuts while the shells are still soft.

The earliest shipments of the walnuts of Europe came into this country from England. Probably merchants in London sent them to merchants in New York. The dealers did not ask where these walnuts grew, but told people who asked that they came from England. This explains the name by which everybody now calls them.

Far back in its history, this tree grew wild in Persia, and on the wooded hillsides of Asia Minor. The people gathered the nuts for food. It was the custom of visitors to send presents of these nuts back to their friends in Europe when they were travelling in the Orient, and discovered how very good these unknown nuts tasted. Englishmen were among these who were loud in

praise of them. "Walnut," the name they gave the trees, means "a nut that comes from a foreign country." The Greeks had called it "Jove's acorn," for they could not think of any other name good enough. Kings sent presents of nuts to each other. Then people began to plant nuts, instead of eating them all, and gradually all the warmer countries of Europe found they could grow these walnuts.

The size and quality of the nuts improved under cultivation. Now there are many varieties, all larger, thinner-shelled, and better-flavoured than the original wild nuts that still grow in the forests of Asia Minor.

In the centuries when the countries of Europe were always at war with their neighbours, another reason for planting walnut trees was discovered. No wood was so good for gunstocks. No young man could marry until he had planted a certain number of walnut trees. This was the law in some countries in the seventeenth century. So multitudes of these trees were set out. Besides gunstocks, walnut wood was much in fashion for handsome furniture. A walnut forest was a very profitable crop to raise, for lumber alone. A tree that bore such nuts, while its trunk was growing big enough to go to the saw mill, was doubly profitable. The people of the

colder countries were ambitious to share in this prosperity. But an occasional winter of extra severity killed the young trees.

THE CHESTNUT AND CHINQUAPIN

Next to the hickory nuts, we must rank the chestnuts. Some may give them first place in the list of American nut trees. In England the chestnut trees one hears about are never praised for their nuts. English boys and girls do not eagerly plan for half-holidays spent in the jolly sport of chestnutting. Their chestnut trees turn out to be very familiar to our eyes. They are the horse chestnuts that we see so often at home. Their nuts are handsome enough, and quite worth gathering for use in some games, and just to have and to handle. But chestnutting! That is one of the great joys of October in our country, a thing no boy or girl would miss without bitter disappointment.

While the leaves turn yellow on the big trees, children and squirrels have their eyes on the clustered, spiny balls at the ends of the branches. "Not yet!" is the sign they read as plain as printed words. Warm days come and go, and the tree holds out its sign, even after the leaves

begin to fall. Father and mother say: "Be patient!" But they do not remember how hard that is. It is a long time since they were eight and ten and twelve years old.

Then a cold night comes, and in the early morning a hoar frost is disappearing as the sun rises. Four seams can be seen on some chestnut burs, and the impatient boys throw clubs into the tree tops. But their fingers are sore with trying to pry the burs open. The nuts are cheesy and insipid.

"Just you wait a spell." This is the advice of John, the raggedy man, who does the chores. "You can't hurry up chestnuts. When they're ready, I'll take you where you can get a barrel of 'em, and not kill yourself, nor ruin your hands gettin' 'em." He sees the rising tide of fear before it is expressed in words, and answers mysteriously: "Nobody knows the place but me. Let the little fellers an' the town folks hunt for nuts under the trees along the road. They'll get a quart apiece, mebby, if they work half a day. The place I'm goin' to, you can scoop 'em up in handfuls."

The trees far back from the high road are certainly more generous to the few who find them than are the more accessible, and therefore more popular trees. Nobody "scoops them up in

handfuls," literally, for there are the burs, quite as prickly as before they split their four segments apart, and let the two or three nuts fall out. Careful and quick motions are needed to pick up the pointed nuts among the larger burs. But the game is most absorbing. If the bags fill slowly, there is the consoling thought that the shells are thin, and the nuts are almost solid meats. The busy picker stops now and then to sample a few. They certainly are riper and finer tasting than they were a short week ago.

Unopened or partly opened husks are often gathered. The nuts will ripen and roll out on the attic floor, or on the roof of the side porch. Few parties who go chestnutting content themselves with the loose nuts they gather. The end of the day is a scramble to fill the bags or baskets with hulls not yet fully open. Mittens faced with leather or made of canvas are a good protection for the hands.

The saddest news from the woods of the Northeast is that a disease that baffles the tree doctors has attacked and killed all the chestnut trees in the neighbourhood of the city of New York, and it is marching steadily westward. It has invaded New Jersey and Pennsylvania. A fungus attacking the living layer under the bark of a tree is working where no remedy can reach it.

The tree loses vitality, but only when it is far gone does the disease break through the bark, and show itself as small, yellow pimples on the smooth bark of the branches. Out of these openings the spores escape,—minute germs of the disease. The wind scatters them. So do birds, insects, and squirrels. They lodge in cracks in the bark of other trees. Only chestnut trees catch the disease, though the germs fall everywhere. When it progresses far enough to produce a mat of fungus that encircles the trunk, the tree is girdled, its food supply is cut off, and death results.

The chinquapin is a Southern tree, which closely resembles the chestnut. It is usually shrubby and dwarfed in all of its parts. The nuts are about as large as our little hazel nuts, and each is alone in a spiny husk that parts into halves when mature. Five or six of these little burs are often borne on a single stalk.

In Arkansas the tree reaches medium size, but in the East it is familiar as a scrubby tree that sends up suckers from the roots and forms thickets, like hazel brush. Poor folks in the South have time to gather these little nuts, which appear on market day in their season in some cities and towns. They are sweet, and some people think they are better than chestnuts.

THE BEECH

Least of all the nuts good to eat that grow in our mixed woods is the fruit of the grey-trunked beeches. In nutting time the beech tree's crown of green is almost as clean and bright as in midsummer. The silky leaves are little torn by the wind. They turn to a beautiful pale yellow, and become thin and papery as the green pulp is drawn back into the twigs. Few people see the spiny green burs on the ends of side twigs in summer, even though the crop of nuts be heavy. In the autumn the brown spiny husks open. Their four divisions flare outward, and two triangular brown nuts are released. Almost unnoticed they drop on the ground under the tree. They are so little that the wind helps to scatter them in the woods around. The shifting leaf carpet sifts them through, and we shall have to hunt for them, even under the parent trees.

I need not tell any boy or girl how good and sweet these beech nuts are, and how well they repay the trouble of getting the kernels out of the thin, triangular shells. Yet people gather them less frequently than they do chestnuts, because it is slow work, and there is more accomplished under trees whose nuts are larger.

The early settlers fattened their pigs in autumn by turning them into the woods. Beech trees made the best possible pasture for this purpose. The flavour of beech nut bacon is exceptionally delicate, and has an extra high market value. Squirrels and all of the smaller furry-coats take the time and trouble to gather and hoard quantities of beech nuts among their winter stores.

Fortunate for the beech tree, its nuts will grow even in the shade. We shall find a fruiting beech tree surrounded by its children—saplings of all ages, coming up from seeds of various sowings.

By scratching carefully among the dead leaves in spring, we shall find, among the gaping burs, the young trees at the very beginning of their lives. The nuts have slipped down into the damp leaf mould, and the melting of snow, and the warm spring air have started them growing. The triangular shell clings to the top of the stem, while the root is getting a foothold. A pair of broad seed leaves, totally unlike the leaves of the beech tree, unfold. The spreading of these seed leaves soon splits the walls of the nut-shell helmet.

Little beech trees at this age are very weak and helpless, but patient and struggling. Their pale leaves turn green as the root goes deeper down, and draws food from the soil. A shoot bearing true beech leaves rises from the tip, be-

tween the seed leaves. The stem straightens, and grows tall, the seed leaves wither, and, unless it has bad luck, or some accident befalls it, the the little tree is a long, leafy whip by the end of the season, and under each green leaf is a long bird's-claw beech bud, just like those on the parent trees. In these buds are leafy shoots which will be side branches during the following summer.

Beech nuts are still one of the main foods of many wild animals. In the earlier days they had much greater importance, for nuts were one of the natural foods upon which the human race subsisted before the days when men became civilised. They depended upon foods which Nature provided, and ate them without cooking. Acorns served the same important purpose.

We cannot go back to the days when men lived in caves, and dressed in the skins of wild animals, and lived upon foods like nuts and berries, and the flesh of wild beasts. But in camping out we return as closely as possible to the simple life of these wild ancestors of ours. It is good to know what foods the forest offers to hungry men and beasts. Some day we may be lost in the woods. We may come to an oak tree, and attempt to eat its acorns, but find them bitter. It is well to know that the oaks with finger-pointed

leaves bear acorns that are sweet and good. It is only the oaks with spiny-lobed leaves whose acorns are bitter and unfit for food. Beech trees offer no food to a hungry person, unless he knows how little the nuts are, and how they hide by slipping under the leaves when they fall. To know trees is delightful at any time, and in any place. To know them when one is lost in a forest is often the means of saving one's life. The forest still feeds the hungry, but only those who know the trees are able to find these stores of food when they need them.

THE WITCH HAZEL

The witch hazel is indeed the witch of the woods. It turns the year up-side-down, by blossoming in October, at the same time that it is ripening its seeds. For this reason every child who lives in a region where this little tree grows should know the witch hazel. The better people know it, the more wonderful they find it. It has many odd habits and secrets, which it will reveal only to those who come and ask questions, and keep their ears and eyes wide open to catch the answers.

In spring the witch hazel hides under its green

leaves, and attracts no attention from those who have come out to see the great procession of the spring flowers, under foot, and over head. It is simply a part of the undergrowth, a shrubby little tree. But come in October, to the same place. The acorns are dropping from the oaks, the foliage ablaze with colour, or faded and falling. There are no flowers overhead, but a few belated asters and goldenrods under foot. Squirrels are busy hiding winter stores, gathered under the nut trees, and on the wild hawthorns.

A thicket of witch hazel is slowly dropping its yellowing leaves. You might not have noticed it at all, had not one of the trees suddenly called attention to itself by tweaking your ear! It is such a surprise to feel in the silent woods the sharp sting of a shot from a silent air gun. You stand still, listening, and feeling of your ear. It is fine frosty October day, and still. As you listen, another shot strikes the dead leaves at your feet. Where do they come from? This question you will probably not be able to answer at once; but while you are looking in the bushes from which the missile seemed to come, thinking to rout some joker from his ambush, you discover the blossoms of the witch hazel. Each one is waving four little yellow petals, and among these delicate blossoms the bullet pods are bunched.

Some of these are yawning wide open, each showing two empty seed pockets, but you do not find any seeds.

Cut a bundle of these things, and carry them home. Put them in a vase of water. The delicate fragrance of the flowers will go through the house, and every one will marvel that any tree or bush can be found in blossom at the very end of the year. Now the strangest thing will happen. Above the quiet talk around the evening lamp sounds the sharp click, as of a bit of metal, or a bead striking the wall with considerable force. Every one sits up to listen. A second click, this time on the glass covering a picture, is located, and a little black object, smaller than an apple seed, pointed and tipped with white, is picked up from the floor. It is this seed which was thrown against the glass; and it does not require a Sherlock Holmes to prove that it came out of one of the witch hazel seed pods. If each person takes a twig, and keeps an eye upon the pods, that show a slight opening, more than one of the pods will be seen when they burst, and throw their seeds. The warmth of the indoor air springs the trigger, and the tiny projectiles fly.

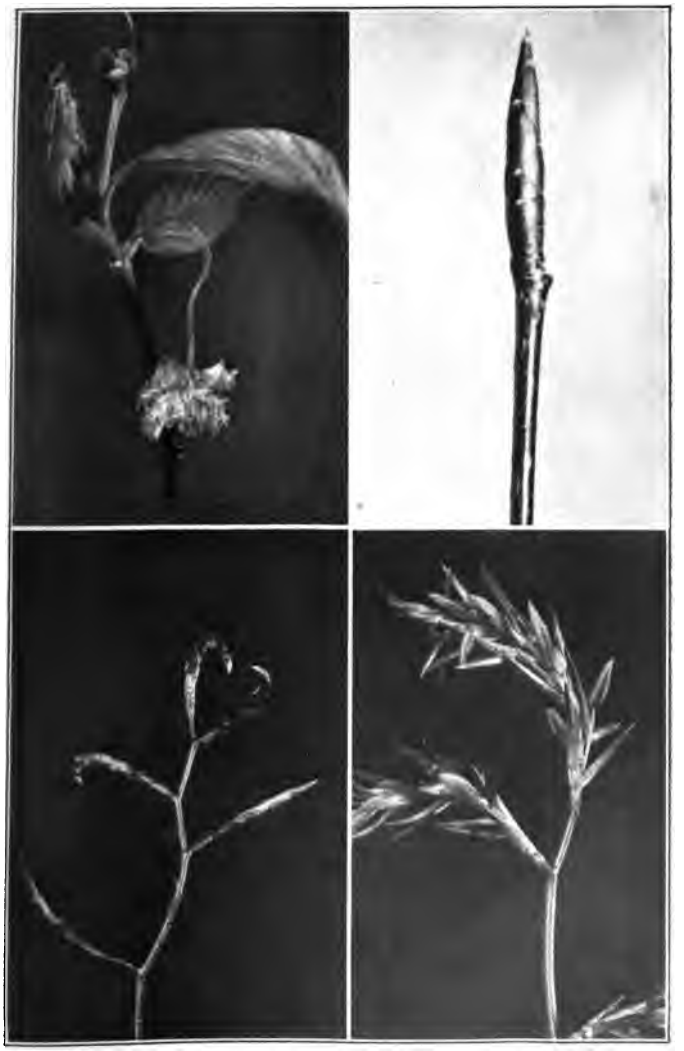
How surprised the squirrels must be when the witch hazel guns are bombarding the dry leaf carpet of the woods! How much pleasure it

gives you to take your friends to the thicket, and explain to them the meaning of those scattering shots the pods are firing each crisp autumn day! If it is rainy weather the pods will all be closed. But let the sun come out, and dry them, and the game begins again.

Can any one wonder that witch hazel trees grow in companies? Each little tree flings its seeds in all directions, and for each seed planted a little tree may come. Twenty feet from the parent tree the pods are able to throw their seeds.

Extract of witch hazel is obtained by boiling twigs and leaves of this tree in a still with alcohol. The Indians taught white men that this plant contained a drug which had soothing and curative powers when rubbed upon sprains and bruises. Whether there is any truth in this notion or not, the belief is still strong, and people continue to rub extract of witch hazel on their bruises, even though many doctors say there is nothing medicinal in it but the alcohol.

In England the witch elm corresponds to our own witch hazel. No one in the mining regions would dare to sink a shaft for coal unless he had warrant for doing so from the actions of a divining rod in the hands of a competent person. In other regions the digging of a well depends upon the same thing, and this idea prevails in



The beech tree opens its two kinds of flowers after the long, pointed winter buds have opened, and the lengthening shoot has spread out its leaves.

Catkins, staminate and pistillate, of a hornbeam and a birch; catkins and acorn flowers of an oak

many parts of this country. An old fellow who can "water witch" may be found in most old-fashioned communities. If you wish to dig a well, you must call on him to locate the site. He cuts a y-shaped twig from the witch hazel, trims it, and is ready for the ceremony. Grasping one of the two tips in each hand, and holding the main stem erect, he paces over the ground you have chosen. In his rigid hands the supple twigs waver, and finally the wand bends downward. This, according to popular belief, is the proper place to find good water, and plenty of it. The water witch moves away, again holding the stem erect. He comes back finally, and as he crosses the spot again, the wand goes down. Now every one is sure that this is the spot, and the well is dug. If the seer's prediction comes true, his reputation improves, and scoffers concede that "there may be something in it, after all." In regions where the witch hazel does not grow, a twig of wild plum tree will do.

THE OAK FAMILY

The fifty kinds of oak trees that are native to America are about evenly divided on the two sides of the Rocky Mountains. No Western

oaks are found in the Eastern states, and none of our Eastern kinds grows wild on the other side of the mountains. The backbone of the continent is a bar that neither group has been able to pass.

To know fifty different kinds of oaks by sight, so as to call each one by its right name, is not an easy task; and yet it is not so difficult as it at first might seem. To begin with, any tree we meet, which bears acorns, we at once recognise as an oak. By this one sign, we are able to set this great family apart from every other tree. As soon as they are old enough, all oaks bear acorns. If a tree which we suspect to be an oak has no acorn to show us, on or under the tree, a little close looking will usually find some acorn cups still hanging on, or lying where they fell upon the ground.

The leaves of oaks are distinctive. In general, they are all simple, and their outline is oval. The borders are variously cut by deep or shallow bays, between sharp points or rounding finger-like lobes. They are leathery in texture, compared with leaves of most trees. After a little practice, we learn to recognise oak leaves, no matter how variously cut their borders may be.

In spring the flowers of oaks come out with the leaves. A fringe of catkins at the base of

the new shoot is composed of pollen-bearing flowers. In the angles of the new leaves farther up the stem, we shall find the little acorn flowers, usually in twos. This is the flower arrangement of all the oaks; staminate and pistillate flowers on the new shoots, separate and very different from each other, but always close together, and always both kinds on each tree. The fringe of catkins falls as soon as the pollen is shed. Little, red, forked tongues are thrust out by the pistillate flowers to catch the golden dust when it is flying through the air, and thus to set seed. All through the summer, the little acorns are growing. We can find them in their tiny cups in the angles of the leaves.

In the autumn the acorns are ripe, and falling. Some trees will show acorns of two sizes, half-grown ones on the new shoots, and full-sized ones on the bare twigs, just back of the new shoots.

This peculiarity divides the oak family into two great groups. One group is composed of trees which have light-coloured bark, bear a crop every year, and in winter are bare of fruit. This is known as the White Oak Group. Its leaves have rounded margin lobes which do not end in sharp points, as many of the lobes of oak leaves do.

All of the oaks whose leaves have pointed, spiny lobes on their margin belong to the Black Oak Group. The bark of these trees is usually dark-coloured. The acorns require two years of growth. For this reason, there are half-grown acorns on the tree all winter, waiting for the second summer to bring them to maturity. Every autumn the acorns which are ripe are found on the twigs just back of the leafy shoots, which grew during the past summer. These acorns have completed their second year of growth.

When we hear any one speak of annual-fruited and biennial-fruited oaks, we know that the White Oak and Black Oak Groups are meant. If you see an oak tree whose leaves are cut into sharp pointed lobes, you will find acorns of two sizes on its twigs. If you look across the fence and see a pale-barked oak with finger-lobed leaves, and not a spiny point on their margins, you will know that acorns of but one size will be found. Fix these three points in mind. Then study all the oak trees you can find.

Trees of the White Oak Group have:

1. Rounded lobes on their leaf margins.
2. Acorns ripe in a single season.
3. Pale-coloured bark.

Trees of the Black Oak Group have:

1. Spiny-pointed lobes on their leaves.
2. Acorns requiring two seasons to ripen.
3. Dark-coloured bark

THE WHITE OAK

Those who know trees best agree that there is no nobler broad-leaved tree in the American forests than the White Oak. Tree lovers in England have but one native oak upon which to spend their loyal devotion, the tree worship inherited from Druid ancestors, whose temples were their sacred groves of oaks. The same feeling is in our blood, and roused at sight of an aged white oak, with stout, buttressed trunk, and great horizontal limbs supporting a rounded dome, much broader than high.

The tree is grey in winter. It stands bare of leaves, clothed in its pale, scaly bark. This is the time to study the framework of the dome. The limbs are twisted and gnarled, and their branches end in dense thickets of twigs. Each twig bears the winter buds, and five buds are clustered at the tip of each.

In spring these buds open, and a leafy shoot comes out of each. At the base are the yellow,

fringed catkins of the sterile flowers, and above them, in the angles between leaves and twig, the fertile flowers thrust out forked tongues for pollen. These will be acorns next autumn, if the pollen falls upon them, and thus sets seed.

All summer the leaves are green, with pale linings, and when summer ends, they turn to rich shades of purplish red. The sweet acorns are ripe, and as they fall, thrifty squirrels are all about, gathering them into their hidden storehouses for winter use. Plenty of the thin, shallow cups we shall find, but the kernels are scarce, unless we come when they are falling in October.

The Indians taught the early colonists in America to use acorns of this species for food. They boiled them, like hominy, and found them not only nourishing, but good to eat.

If you find solitary white oaks growing here and there in a mixed woods, you may wonder how they were planted thus. The tree cannot scatter its own seeds. It depends upon the work of scampering nut-gatherers, in fur coats, that put away more acorns than they can eat during the long winter. An acorn that is left over in one of the dark pockets along a squirrel's runway sprouts in the spring, and in a few years it is a sturdy oak sapling. All oaks are dependent on outside help in planting.

White oak lumber is very high-priced. The wood of this tree we rarely see nowadays except in the most expensive oak furniture. The beautiful satiny streaks that are the chief ornament of the grain in polished table tops, are bands of fibres that radiate from the central pith to the bark. When oak is "quarter-sawed," these *pith rays,* called "mirrors," show to best advantage. They are most numerous in the wood of the white oak.

THE BUR OR MOSSY-CUP OAK

The largest acorn I know is the fruit of the bur oak, and it is borne in a mossy cup, indeed. The cup's scales are drawn out into long, hairy points, and those near the rim form a loose fringe. Once in a while you may find an acorn almost covered up in its husk. But as a rule, the nut is a little more than half-covered. Sometimes these nuts are two inches long, but this is not usual. They are over an inch long, and almost as broad, and the meat is white and sweet. No wonder squirrels harvest the crop, and young trees spring up wherever an acorn is missed by the hungry creatures.

The bur oak is a shaggy tree, for it sheds its bark in big flakes, like the sycamore. The small

branches are stout, and their bark is developed into corky wings, like the sweet gum. The tree is irregular in shape, too, its gnarled limbs are thrown out in any direction, and so the top is often unsymmetrical. But it is a rugged and picturesque tree, in spite of all its faults, and it adds beauty of an unusual kind to parks and woodlands.

In Sioux City, Iowa, an aged bur oak stands in Riverside Park. It is called "The Council Oak," for it was a venerable tree in the days when the Indians lived on the banks of the Missouri River. Under this tree their chieftains used to meet the white men, and talk over the questions that interested both. Here treaties were drawn up and signed that kept peace between the red and white men.

I promise a great deal of pleasure to any one who plants a mossy-cup acorn. The seedling tree is wonderfully vigorous in growth. The leaves are often a foot long in the first years of the tree's life. The blades are thick, lustrous above, and woolly lined, the finger lobes irregular, and two opposite, deep sinuses near the middle of the leaf cut it almost in two!

Before the tree is more than a sapling it blossoms and bears big acorns in their handsome mossy cups. There is no stage in the life of

one of these oaks that is not beautiful and interesting.

This tree is found from Nova Scotia to Western Texas. It forms forests in Winnipeg, and "oak openings" in Minnesota and Dakota. It is as much at home in the hot, arid stretches of the plains of the West and Southwest as in the raw, damp air of the New England coasts. In the rich valley of the Ohio River it reached nearly two hundred feet in height in the virgin forests.

Unlike many oaks, it may be safely transplanted while young.

THE LIVE OAK

The citizen of New Orleans takes his Northern visitors to Audubon Park, and points with pride to the giant live oak trees. He does not hesitate, for he knows that the noble pair called "George Washington," and "Martha Washington," though crippled now by tornadoes, are more noted the country over than any monument or building in this famous old city. In Charleston and other Southern cities it is the same. Famous old live oaks adorn the parks and avenues, and the same trees are planted year by year to take the places

of the veterans when age and storms shall make an end of their long lives.

These trees wear a crown of green throughout the year. The leaves last but one year, but they cling to the twigs and remain green until they are gradually pushed off by the opening of new leafy shoots. In spring the new leaves are much brighter than the darker old ones. Everywhere the trees are draped with the sage-green ropes of "Spanish moss," which is not a moss at all, but a flowering plant that steals its living by lodging its roots in crevices in the bark of trees.

The live oak acorns are dainty, dark-brown nuts, set in hoary, long-stemmed cups. Each year there is a good crop of acorns, and they are sweet, and pleasant to the taste. The Indians depended upon them for food, roasting or boiling them. They also skimmed the boiling pot to collect the oil, which the early colonists said was much like oil of almonds.

The "knees of oak" that early ship-builders used to brace the sides of vessels, were taken from live oak trees, where the great boughs spring out from the short, stout trunks. This natural joint is better than any bolted union of two pieces of timber. The scarcity of these trees makes it impossible now to supply these knees, but no steel frame serves the purpose quite so

well. The wood is as beautiful as white oak for the making of handsome furniture, though it splits more easily, and is harder for the cabinet-maker to use.

The tree grows throughout the South to Texas; also in Mexico, and Lower California. Its Northern limit is Virginia.

A friend who has for a near neighbour the majestic McDonough Oak, patriarch among the noble live oaks of the Audubon Park, New Orleans, writes interestingly of the habits of this species.

"The live oak sheds its leaves *in the spring,* just before the new leaves open. So, for a brief time the tree stands leafless. In this period, however, the tree put out catkins in great abundance, so that the tree does not appear bare. These catkins are light brown, and have a soft, velvety appearance, and a tree has an absolute change of colour. During this blossom time the splendid form of the trunk and the great limbs is revealed. When the new leaves appear, the framework of branch and bough is concealed by leafage so dense as to be impenetrable to sun or eye. The tree is a symmetrical, shining green dome. The crown of the McDonough oak is over two hundred feet in diameter."

THE POST OAK

The post oak, a small, rugged tree, is noticeable in winter, because its leaves usually hang on until the open buds in spring push them off. The colour of this winter foliage is yellowish brown, and not at all striking nor beautiful. The bark is brown and deeply furrowed. The twigs wear a yellow fuzz. The leaves are coarse, stiff and rough, four to five inches long, tapering from three broad, squarish lobes to a narrow base, and a short leaf stalk. They are lined with brownish wool, and are dark green and shining above in summer.

The acorns of the post oak are borne in a plentiful annual crop. Each is dainty and trim, in a shallow cup of loose, blunt-pointed scales. The kernel is sweet. In the days when wild game roamed the woods, wild turkeys fattened on these acorns, and some people call the tree the "turkey oak."

Another name for this tree is "iron oak," for its wood is hard, and heavy, and close-grained. It makes admirable posts and railroad ties, because it does not rot in contact with water. It is used in boat-building, and for barrel staves. "Knees" of post oak (the angles between trunk

and branch) form most admirable timbers to be used in the framework of boats.

THE SWAMP WHITE OAK

The swamp white oak is a rugged and ragged tree, with drooping branches and crooked twigs, covered with greyish brown bark which peels in thin flakes from branches and trunk. This habit of shedding its bark in irregular plates reminds us strongly of the sycamore, which carries this habit to excess. The leaves of this oak are large, wedge-shaped at the base, wavy-toothed or lobed, and broadening towards the tips. They are dark green above, and lined with white down. The acorns are borne in pairs on long stems. The oval nut is hairy at its tip, and sits in a rough cup made of scales, sometimes fringed at the border. The kernel is sweet and eatable, not only for beasts, but for man. If one were lost in the woods, he need not starve nor die of thirst, if he is near a stream, and can get the fruit of a swamp white oak, which stands by the water side. He will do well to make a fire, and roast the acorns, which will improve their nutty flavour, and make them more digestible.

This white oak is more beautiful in May than

at any other season of the year. The young leaves are pale green, and the tree top is illuminated by the silky hairs that line them. The whiteness of the down is dimmed as summer advances. In the autumn the leaves turn yellow, but never red.

The wood of this oak is not distinguished in the lumber trade from any other white oak. The demand for it for the building of houses and boats, and for agricultural implements and vehicles, is greater than the supply. It is too expensive now to be used as it was a few years ago, for fuel, railroad ties, and fence posts.

THE CHESTNUT OAK

The chestnut oak has leaves which are much like those of the chestnut tree. They are larger, and wider, however, and have rounded lobes at the ends of the side veins, making a very regular wavy margin, compared with that of most oak leaves. The lining is often silky, and always much paler than the upper surface. This tree is an exception to the rule that the annual-fruited oaks have pale bark. This one has bark so dark in colour that it is often mistaken for one of the Black Oak Group, although its wavy leaf

margins, and its annual crop of acorns, prove it to belong to the White Oak Group.

The acorns are very long, and smooth, and they sit in thin cups lined with down, and covered with small swollen scales. They are usually borne alone on short stems. This is one of the largest and sweetest acorns. The squirrels pack them among their winter's stores.

The wood of chestnut oak is hard, and strong, and durable in contact with the soil. The bark is especially rich in tannic acid. For this reason many of the finest trees yield only tan bark, because the peelers take the bark, and leave the log to fall a prey to forest fires.

THE BLACK OAK

The black oak, which gives its name to the large group of biennial-fruited oaks, is one of our handsome, sturdy forest trees. It grows from Maine to Florida, and west to Minnesota, Kansas, and Eastern Texas. Its bark is very dark grey or brown, and thick, with rough, broken ridges and deep furrows. Under this outer layer is a yellow belt, rich in tannin. This gives the tree the name "yellow oak," and since

its bark is valuable in tanning leather, it is sometimes called the "tan bark oak."

The tree is not graceful nor symmetrical, but there is a picturesqueness and strength about it that redeems its coarseness and irregularity. This species would be planted oftener for shade, were there not so many beautiful oaks to choose from. In the wild, however, a giant black oak is a noble feature of the landscape.

In early spring the large downy winter buds begin to swell, and soon the leaves push rapidly out. The whole tree top flushes crimson in the sunshine. The red glow is from the crinkly, half-awake baby leaves, whose brilliance is softened by a silky covering of white hairs. In a day the leaves turn green, and most of their silky covering is shed.

The bloom of the black oak consists of a fringe of yellow catkins at the base of each shoot, and pairs of red-tongued acorn flowers in the angles of some of the leaves. Back of the new shoot the half-grown acorns of the previous season are seen. In autumn the new crop is well along and the full-grown acorns, which have taken two seasons to ripen, are ready to be shed. Each kernel sits in a straight-sided cup of loosely shingled scales, which form a fringe at the margin. The kernel is bitter, and yellow, as it is

Leaves, mossy-cup acorns and warty twigs of the bur oak

The horizontal limbs of the pin oak form a regular pyramidal head

in most of the species of the Black Oak Group.

The large, downy, pointed buds of this oak will often determine its name for us when we are confused by the shapes of the leaves. Often the red oak and the black oak "run together" in their leaf forms. To determine the tree's name we must call in the buds, the acorns, and their cups, and the general shape of the trees, and consider all these points together.

Black oak leaves are thick, coarse, and leathery. Crumple one in your hand, and you cringe at the harsh scratching noise it makes. They vary from four to ten inches in length, and from two to six inches in breadth. The margins are deeply cut into seven or nine broad, bristly-toothed lobes, with rounded bays between. The upper surface is dark green in summer, shining and smooth, or sometimes hairy. The lining is brownish and a remnant of the scurfy down is found in the neighbourhood of the veins. In autumn these leaves turn brownish-yellow, but rarely show a tinge of red.

The bark of black oak is stripped and carried to the tan-yards. Or it furnishes a yellow dye, used in the printing of calicoes. The wood is used in house-building, and in the manufacture of furniture.

THE RED OAK

The red oak is the tree most likely to be mistaken for the black oak. The bark is brown, with a decided red tinge. The twigs are also reddish, and the wood is red-brown. The inner bark has the same tinge instead of the orange-coloured lining the black oak bark has.

The red oak is a large, stately tree, sometimes 150 feet in height, and far more symmetrical than the black oak. Its leaves vary greatly in the depth of their marginal clefts, but in general they are oval in outline, and their lobes and sinuses are triangular. These lobes always point forward, rather than outward, along the sides of the leaf, and they always end in the sharp, spiny points that belong to the leaves of all the trees that fall into the Black Oak Group. Red oak leaves are thinner than those of black oak, and not so harsh when crumpled in the hand. Their linings are pale green and smooth in summer. Their autumn colour is deep red.

The buds of the red oak are pointed, smooth, reddish, and about one-fourth of an inch long. They are much smaller, and lack the down of the buds of the black oak.

Red oak acorns are the most distinct feature

of this species. They are large, often over an inch in length, and broad, and they sit in saucers, instead of cups. These saucers are made of close scales, and they curl in closely at the top as if to tighten their hold on the nut, which extends two-thirds its height above this rim. The kernel is white, and extremely bitter.

THE SCARLET OAK

The scarlet oak need not be confused with either the red or black oaks, for it is a far more dainty tree than either in its trim trunk, graceful curving branches, very slim twigs, and deeply cut leaves. In form, these leaves are oval, but so much of the "cloth" is cut away by the four or six deep bays along the sides that a small amount of green is left to do leaf duty. The slender lobes are strengthened by the branching veins, each of which ends in a spiny point. These almost skeleton leaves are beautifully lustrous and thin, a trifle paler beneath and sometimes hairy tufted at the veins. They are rarely six inches long, and the side lobes sometimes measure five inches from tip to tip. The leaf stems are long and flexible, and the whole tree top is as light and feathery and tremulous in a breeze

as that of a honey locust or a willow. In autumn the scarlet oak blazes like a torch above the duller reds and browns of the woods, and keeps its brilliancy later than any other oak.

The acorn differs from the black oak in being smaller and daintier, and in having its cup drawn in tightly at the rim. The scales are smooth and close-pressed; the kernel white and bitter.

THE PIN OAK

The pin oak has foliage much like the scarlet oak, but coarser and not so lustrous. Often a pin oak tree has leaves that approach the red oak in form, and these lead to confusion, if leaves alone are consulted in determining the name of the tree. There are better signs in any pin oak that set it apart from its larger-leaved relative. Consult the acorns. They are plump little nuts, as broad as long, rarely measuring one-half inch either way, pale brown, streaked with black in straight lines, down from the pointed tips, and they sit in shallow, saucer-like cups made of close reddish scales. As they fall, the nuts roll out of the cups, which are lined with hair. The kernel is white and bitter, and yet, late in winter, it is very common to

find them gnawed open by some hungry little four-foot, whose winter store threatens to run short.

The pin oak takes its name from the fact that its branches are thickly set with short, pin-like twigs, many of which die but do not fall. These stubs stay on for several years. This fact alone will soon enable us to recognise the tree from a distance. No other species is so close-twigged, and the symmetrical form of this tree is very striking in the winter. It is a pyramid with many small branches thrust out horizontally from the main shaft. Below the middle of the tree, the long branches have a downward thrust, and the lowest ones often sweep the ground. Above the middle of the tree the branches are horizontal, and they gradually become shorter, and the tree ends in a pointed tip. There is no oak that I know which has so much the pyramidal form of evergreens like the firs, hemlocks, and spruces.

On the avenues of the city of Washington, we shall find superb double rows of American trees. On one which leads to the Navy Yard, I remember the beautiful pin oaks, uniform in size, perfect in symmetry, that stood in a double row along the sides of the avenue. To the crowds of tourists who visit the capital city every year, I hope that this will be an object lesson. In

most towns and cities every owner plants the trees he likes in front of his house, so our streets and avenues present a mixture of trees of all ages, sizes, kinds, and conditions. The better way is for the city to plant the same tree in double lines, the whole length of a street, as has of late years been done in Washington. One needs only to see these trees coming on, each year adding beauty and dignity to the city, to realise that such planting may be done easily anywhere in the country, where trees as beautiful as the pin oaks grow wild.

THE WILLOW OAK

A Southern tree with slender twigs and narrow leaves like those of a willow, surprises us by bearing acorns! It is the willow oak, a beautiful, graceful tree for shade and for avenue planting. The tree naturally chooses wet ground, but it thrives where the soil is deep and well drained. I remember a fine large willow oak in John Bartram's garden in Philadelphia, and a young tree in the Arnold Arboretum in Boston. This little one grows rapidly, but the frost nips its twigs in the winter. The species grows wild from New York southward, just back from the

sea coast, to Texas. In swampy land, it is found from Missouri southward.

Willow oak acorns are downy, yellow-brown, and set in shallow saucer-shaped cups. The kernel is orange-yellow, and bitter. Half-grown acorns are found with the ripe ones on these trees, and the dark, rough bark agrees with others of the Black Oak Group. Though the leaves have rarely a side lobe, but are mostly narrow and plain-margined, the tip ends in a spine, as all black oak leaves should.

TREES WITH WINGED SEEDS

Why do the trees grow in such mixed groves, when Nature does the planting? Here and there we find solid groves of beech or oak, but the forest is, for the most part, a gathering together of all kinds of trees. A part of the beauty of any woodland is this variety in the planting. Under a tall oak we find a hornbeam, and under this the witch hazel, and under the witch hazel, a carpet of low woodland plants. We may walk in a straight line, or follow a woodland path a mile, and find every tree we meet is different from all the rest.

Many reasons explain the order in which Na-

ture plants forests. One of the best of these is found in the kind of seeds trees bear. We shall find that trees most widely scattered are those whose seeds are winged. It is not hard to find, from May until far past midwinter, trees bearing light, winged seeds. All through the summer, the wind is busy sowing the seeds of the early-fruiting trees. In autumn, and all through the winter, the sowing of the larger crop goes on.

Let us begin our study with the maples, whose winged seeds every child knows. From the silver maple, whose seeds are dry before the first of June, there is a procession of ripening maple seeds that lasts throughout the year. A high wind shakes off the silver maple's keys in showers in late May. Watch those in the tree-tops. The wind has a better chance up there. Each key, loosening from its twig, turns round and round in a dizzy whirl, and sails away still whirling as it falls, the heavy seed end always pointed downward. A tree is soon stripped, and the ground littered under it. But a great deal larger area than the tree's shadow has the seeds scattered over it: the stronger the wind, the further these seeds go. Before the summer is over, a crop of little maple trees springs up from this sowing.

The red maple's scarlet seed clusters turn brown, and the little winged seeds take flight in June. Lighter and smaller, they are carried longer distances than the seeds of the silver maple, and a crop of little red maples follows this June sowing of the trees.

I remember walking in a corn field in late June; the corn had been last ploughed a month before. Among the weeds that had grown up in this short time was a crop of young red maples, now six inches high. It was amazing to see these little trees grow so plentifully in a cultivated field. I looked for the seed tree, and there it stood on the edge of the field, the only maple tree in sight. A few young trees were growing in the matted grass of the roadside under the tree, but the great crop was from the seeds that flew out to the mellow ground between the corn rows. The disappointed seeds, those which fell and did not grow, were under the tree and in the dusty road.

In the autumn the hard maple, which we call the sugar maple, ripens its winged seeds. So does the three-leaved box elder (which is a maple) and the Norway maple, now a very familiar street tree. The wind takes its time, and the trees stubbornly hang on to their seeds, so that these maples are busy all winter with the

sowing. Every day they give up a few, and many seeds that fall on the snow are picked up, again and again, by the wind and thus carried further and further away.

The maple seed, with its curiously one-sided wing, is the sign by which the maple family is easily recognised. Other trees have winged seeds, but none have the peculiar form of this one.

All summer long we may know the trees that belong to the ash family by the clusters of pale green darts that hang among their leaves. These are the ash seeds. Each one is a pointed seed case, containing the embryo plant, and out behind it extends the thin, light, two-edged wing. There is no one-sidedness to this blade. The seed is winged, but balanced like a dart. When the wind loosens one from the wiry stem, it goes like an arrow, seed downward. If there is a gale blowing, the seed may be caught up and borne far away in the upper air, before a lull lets it take a downward course, and drive its point into a snowbank, or into the ground. This little feathered arrow may be long or short, depending upon whether it belongs to the red ash, the white ash, or the black; but there is no mistaking an ash tree for any other, once the form of an ash seed is fixed in the mind.

I have said that a maple seed is shaped like that of no other tree. I must describe here the seeds of the needle-leaved evergreens, which, though very much smaller, are somewhat like maple seeds in form. Go to a pine tree or a spruce, and get one of the cones that has begun to spread its scales apart. Shake the cone over a piece of paper. If nothing comes out from between the scales, cut or break the cone open with knife or hatchet. Under each scale will be found two seeds, each with a thin, one-sided wing. Spruces, hemlocks, firs, and arbor vitæs, all have this same type of seed, hid away in the same fashion, under the protecting scales of their cones. Do you understand how the wind, blowing through the tops of evergreens, shakes the winged seeds from their places, and carries them far away? Do you understand why the ripe cones of these trees hang on so stubbornly, and spread their scales to allow the seeds to escape?

It is a peculiarity of the firs that they hold their cones erect. It would seem hard for the wind to get at the seeds, but the fir cones let their scales fall, and when they loosen, the seeds are freed.

Out of the balls of the sweet gum tree, which dangle on the twigs all winter, the wind shakes little winged seeds, not unlike those of the pines.

Do you know the catalpa's long, green pods that hang all summer on the top of trees? They are longer than the newest lead pencil, and show no signs of splitting, until the autumn. Now, the two halves of the pod spread apart, and gradually the thin seeds shake out. Each one is in the centre of a thin, fringed wing, that looks as if made of tissue paper. The wind can carry these ghostly seeds for miles. Indeed, it is strange that they ever come to the ground, for they seem to have no thickness nor weight at all.

The birches all bear their seeds in cones, some long and pencil-like, others quite the shape of a pine cone. Under each quaintly notched scale of the cone, a seed is borne; and each heart-shaped seed has a thin rim, which acts like a wing, catching the wind as the seed falls. We shall look far in the woods before we find seeds daintier in form, or better sailors through the air, than those of all the birch family.

The hop hornbeam has a hop-like cluster of seeds, each in an inflated papery bag. When the leaves drop in the fall, the wind has a chance to pick off these little paper seed balloons, one at a time, from the clusters. Take off one of these little bags, open it, and you will find, set in the bottom, the shiny, pointed seed. It is

likely to have a long journey, if there be a good breeze, before its bag is punctured.

Back to early May again, when the elm trees are green with their fruit clusters, before the leaves are fully out. Elm trees grow scattered through the woods, and no wonder: the seeds have papery rims, and the wind catches these little falling discs, and scatters them far from the tree where they were born.

The ailanthus tree, whose long, fern-like leaves make it look like a tree from the Tropics, is sowing its seeds all winter, with the help of the wind. Examine one. In the middle of a slim blade is the little seed. The blade is twisted as it ripens, and it sails through the air with a tilting, uncertain flight. After a look at a bunch of these seeds, and after throwing a handful of them out of an upper window, and watching them as they sail away, we shall understand how it is that ailanthus trees spring up in most unexpected places, year after year. And we shall bless the breeze that plants such trees along the hot pavements, and in the ugly back alleys of towns and cities, where few trees are able to grow at all.

TREE SEEDS THAT HAVE PARACHUTES

It is a thrilling moment when the man who goes up with the balloon lets go at last, and drops to the ground. Before he drops, an umbrella-like parachute opens, and by its aid, he comes to the ground gracefully, slowly, and alights unhurt. Should anything go wrong with his parachute he would drop to his death, so every onlooker is anxious as he comes down, and breathes a sigh of relief when the wonderful feat is accomplished.

Seeds with wings sail away on the wind, and seeds with parachutes descend so slowly and gracefully that the winds carry them far out of their courses. The trees most fortunate in scattering their seeds, and thus colonising new territory, have peculiar devices.

The seeds of the basswood hang in clusters attached to a narrow, leaf-like blade. This is a parachute, by which the whole cluster is able to sail away on a good breeze. There is no seed parachute like this among our forest trees. By this sign alone we may know the basswood trees.

The balls of the sycamore bump against the

branches, and tiny seeds with hairy parachutes are loosened and scattered. Each is a minute spike, which might drop to the ground, but for the umbrella-like parachute made of a brush of fine hairs. By this, the wind lifts the seed, and carries it away.

Willow seeds, and those of the poplar, are almost too small to be seen. Each seed is hid in a dainty fluff of white cotton, and in this the seed rides. We may miss seeing these trees in fruit, unless we look at the down which accumulates in June on the screens of windows and doors. The air is full of the fluffy stuff when the pods open. In a few days this harvest is over, and we may find the empty pods on the ground under our neighbour poplars, cottonwoods, and willows.

The blue beech, or hornbeam, has a parachute which is leafy, and crinkled so as to look almost like a little boat. The shiny seed sits in one end, and when it gets free, it has a fine long sail through the air before it settles to the earth.

There are wings and parachutes on the seeds of other trees. When you find them you may know that the wind is the partner of the tree, by robbing it of its children. The wind is saving those children from death, which would have been their fate, if they fell on the ground under

the shadow of the parent tree. If all the fields that adjoin the woods were left uncultivated for a few years they would grow up to forests. We know the name of the sower, who gathers seeds in the woods, and plants them; who is busy all the year at the endless work of the harvest and the sowing.

THE AUTUMN BERRIES IN THE WOODS

In the roadside thickets, as the summer wanes, the berry clusters of the shrubby viburnums turn red, and soften, and in September change to a vivid, or a dark blue. They are very pretty on their coral red stems, and look like little plums. Indeed, they are not unpleasant to taste, but it is the birds who delight in these sweetish, juicy berries, and we are willing that they should have them all. The names, sheepberry and nannyberry, are given to these little trees, because sheep are said to browse on the foliage and shoots in spring.

The blue berries of the sassafras, also on coral red stems, are not unlike those of the viburnums in appearance, but fewer in a cluster. The birds take them eagerly before they are fully ripe. To leave them until they ripen would be to lose them to other birds.

Cone fruits of (1) a birch, (2) a pine, (3) a magnolia, and (4) a fir

Clusters of the winged seeds of hornbeam and white ash

The dogwood berries are redder than the whorl of leaves that surround the fruit clusters in early October. These waxy berries have taken the place of the central cluster of small flowers, which were surrounded in spring by the four large, white bracts.

It is the birds who first accept the invitation of these little trees. The migrating hosts turn southward in September, and in October the bird procession is in full swing. We hear them overhead, often so high in air that we cannot see them. Tired of the long flight, they descend for food and water, and if the neighbourhood has many fruiting dogwood trees, the joy of the winged voyagers is correspondingly great. In a surprisingly short time the hungry birds have taken the last one.

Far in the winter we shall find red berries glowing in clusters on the mountain ash trees, among the evergreen holly leaves, and in conical spikes on the sumachs. The winter birds ignore these dry, insipid seeds, until everything else is gone. Frequently, when winter snows cover up all other foods, the berries of these two trees stand between the birds and actual starvation. So it happens that many a mountain ash is stripped of its fruit during the early days of March, and the holly berries which have glowed

red all winter disappear for the same reason. The sumachs are rarely stripped as closely as the other two.

In September the hackberry hangs full of its sugary fruits. It is surprising to find a tree which looks like an elm, yet bearing soft, purple berries. But this, we shall learn, is the hackberry's way. Under each leaf a long thread grows, on the end of which is a single, oblong berry, the size of a pea, but not the same shape. The fruit hangs on late into the winter, if the birds will permit such a thing, and it is a grateful supply of food to birds that winter in the North. If there were no other reason for planting hackberry trees, they are worth having as fruit trees for the refreshment of birds.

The autumn colour of hackberry leaves is yellow. The purple fruits make little show, until the leaves fall. The bark of the tree is its chief peculiarity. On the trunk it is deeply checked into small, thick, warty plates. The branches are often ridged and broken into warty excrescences that stand close together.

The leaves are peculiar. There is no other tree that has not a main vein, or a rib, which prolongs the leaf stem straight to the tip. The hackberry leaf stem divides into three equal branches at the base. The two side branches are

shorter than the middle one, but their size is unusual.

It is in autumn, of course, that the hackberry earns its name, sugarberry. The bark will guide us to the tree at any season. The leaves fix in mind another important family trait. The berries we may safely taste to find out if they are as sugary as we are led to expect.

Nettle tree is the common name of the European hackberry. You may have read of the lotus-eaters, who, tasting the sweet fruit of this little tree, straightway forgot their native land, and could not be persuaded to return. The wood is tough and peculiarly adapted to make the handles of hayforks, and similar agricultural implements. Young trees are grown for these uses. The roots remain alive and send up suckers, slender but tall. These are cut for walking sticks, whipstocks, and ramrods for guns. Older trees furnish wood, as hard as box or holly, and beautiful as satinwood when polished. This is a material which the wood-carvers delight to use. The tree is widely planted for shade, and its leaves are used as fodder for cattle.

Bad as its reputation is, according to the tradition that its fruit had power to rob men of their patriotism, yet this is one of the most useful little trees. It grows easily, and is con-

tented on land that is worthless for other purposes.

Besides the hackberry, another big tree in our woods bears a crop of purple berries in September. That is the wild black cherry. The bark of this tree is dark brown and shining, and satiny smooth on the branches. It breaks on the trunk into rough, squarish plates, which curl horizontally at the edges. The plates still retain the silky outer bark, whose fibres run crosswise, and whose surface has many slit-like, horizontal breathing holes.

We are strongly reminded of the birches, especially the cherry birch, which has dark-coloured bark, and has its name from its resemblance to this tree. The thin young bark of the black cherry curls in a very birch-like fashion. One difference is very marked. The bark of the cherry is bitter, with the flavour of the pit of a peach or cherry. Birch bark is pleasantly aromatic in flavour.

The fruit of the black cherry is more plentiful than that of the hackberry. The close-set side shoots on the new twigs end in fruit clusters two or three inches long, and often containing a dozen berries each. The sweet pulp is flavoured with the bitter taste of cherry pits, a flavour found in the sap of this tree. Nibble the bark,

or a bit of cherry wood, a leaf, or the tip of the root, and you get the same Prussic acid taste.

I do not like wild black cherries, but many people do. Children and birds seem not to notice the bitter with the sweet. They eat the berries as soon as they change colour, with evident enjoyment.

Cherry brandies and cordials are made from the fruit by people who rely upon old-fashioned home remedies. These are the people who chew the bitter opening buds of the wild cherry in spring, as they drink sassafras tea, believing that spring is the time to clear the blood, and that Nature offers free remedies far better than they can buy in bottles.

We cannot wonder that wild cherry trees spring up in the woods, in fence corners, and along roadsides. The birds are feasting in the trees each autumn, and until the last berry is taken. They are the sowers of the seed.

Our greatest objection to the wild cherry is the fact that its shining young leaves are regarded by the apple tree tent caterpillars as particularly good. When the white blossom clusters deck this tree in May, we often see a web of white silk wrapping together some of the upper branches. Day by day the web is extended,

and the twigs are stripped of their leaves by the host of caterpillars which return at night to the tent, and range more widely in the day time. When the tent is as large as a peach basket, it is found empty, for the caterpillars have descended to the ground, spun their cocoons, and will soon emerge as winged moths, to lay their eggs, from which later broods of caterpillars come. The winged females are very likely to seek the nearest orchard, and lay their eggs in bands around apple twigs. Many an otherwise harmless roadside wild cherry is a deadly menace to an orchard because it breeds the insects, which, in a second generation, become a serious pest among the apple trees.

In the forest the lumberman is glad to find wild black cherry trees of large size. The lumber is very valuable for interior finish of houses, and for furniture. It is hard, and close-grained, and dark reddish-brown in colour, with a lustre, when polished, that puts it in the class with mahogany and rosewood. It is more often used nowadays as a veneer on cheaper woods. Parlour cars and steamships, and fine houses are very often finished in cherry. The small limbs and other bits of the lumber are utilised for tool handles and for inlay work. The wood is too valuable to waste.

The largest berry that grows on a tree in the woods of the United States is the persimmon. We should mistake this berry for an apple, perhaps, when we see it for the first time—a little, orange-brown apple, one to two inches in diameter. But there is no core such as apples have, though there are from one to a dozen seeds in each fruit.

The persimmon tree is tall, with a handsome round head, and zig-zag, twisted branches. It grows from Rhode Island west to Kansas and south to Florida and Texas. It is found scattered in mixed woods, and comes up in fence rows and in abandoned fields wherever the seeds have been dropped. Light, sandy soil is this tree's preference. Although it is a relative of the ebony of Ceylon, our persimmon is not an important lumber tree. Its wood is hard, dark-brown in colour, and is used for shoe lasts, tool handles, and various other small articles.

In the South the persimmon ranks among the choicest of fruit trees. The negro and the 'possum await the ripening of the 'simmons with eager eyes, and the Southerner, born and bred, confesses an equal interest in this native fruit. There is a long waiting period between the time when the persimmons change colour from green to reddish-yellow and the time when the frost

mellows and sweetens the pulp, and takes away the harsh, puckery taste which draws the lips and chokes the throat as if the fruit were a lump of alum. The Northerner who judges by its appearance only, dares to taste this fruit before it is ripe. He cannot be persuaded to try it again. And he cannot understand the enthusiasm for persimmons that all people in the South feel.

A 'simmon tree, when the fruit is ripe, belongs to the first comer. The negro and the opossum come into direct competition for the fruit of this tree. You might think the negro would kill the opossum, and be rid of his rival. He knows too much for that. "'Possum an' 'simmons come together, and bofe is good fruit." Better divide the 'simmons with the 'possum and his family. Then get the fat 'possum for the Christmas dinner. There is no 'possum like the one that is fattened on persimmons, so it pays to be patient and leave the beast his share of the fruit.

In a hollow tree, or a woodpile, the opossums sleep by day, and trail out in companies to climb the persimmon trees at night to feast. They hang by their tails on the branches, or prop themselves in crotches of the limbs within easy reach of the soft, sugary berries. The fatter they get,

the lazier they are; and as the season advances, and the fruit falls, the opossums are likely to satisfy their appetites with the persimmons they can pick up under the trees. Along about Thanksgiving day, or Christmas, the day of reckoning arrives, when the negro hunter comes home with the opossums which have stolen his persimmons. The whole score is wiped out by the opossum feast, which suitably closes the season.

Persimmons improve, the longer they hang upon the trees. As late as January or February, little trees scarcely a dozen feet high, which have been overlooked in the 'simmon harvest, are found to be still hung with fruits exceptionally large and fine. To the hungry and thirsty hunter, prowling for quail in the underbrush, these unexpected fruits are a delightful surprise. They are delicious, sugary lumps, rich in flavour, and juicy, taking away both hunger and thirst, and leaving no after-taste that is bitter or puckery, suggesting their unripe stage.

Japanese persimmon trees, whose fruit is larger and better in every respect than our native species, have been successfully introduced into California and the Southern states. These persimmons look like great ripe tomatoes as we see them on the fruit stands, but these, too, must wait

until they are thoroughly ripe before they are fit to eat.

THE CHANGING COLOUR OF THE AUTUMN WOODS

All through the autumn, when the wonderful colours come in the forest leaves, we shall see the green of these leaves creeping back along the veins. The horse chestnut leaves tell a very interesting story. They turn brown first upon the edges. If we watch a single leaf for a whole week in September, we may see the green gradually draw in towards the central stem, and the brown papery borders widen, just as if something were squeezing and crowding the pulp of the leaf, inch by inch, back through the leaf stem into the twig. The last traces of green linger along the sides of the veins, and before it falls, even these leaf channels will be drained dry.

When the leaves of a sugar maple give up their pulp there are wonderful changes inside each leaf. A yellow liquid fills the cells where the green pulp used to be. Chemical changes in the mineral substances deposited in the leaf cells produce wonderful shades of red and yellow,

which glow where once the leaf was solid green. Iron is one of the minerals brought up in the soil water, left in the leaf, and changed to produce the bright red when the leaf mask of green is taken away.

The scarlet maple remembers its name in the autumn days. It puts on a cloak more brilliant perhaps than the sugar maple, which has a good deal of orange as well as red in its autumn foliage. The scarlet oak is amazingly brilliant; so is the sassafras and the sweet gum. The tupelo, or sour gum, also called the pepperidge, has foliage that is splashed and streaked with various shades of red and yellow. Each little leaf is so brilliantly polished that the tree's beauty and colour seem to be doubled by reflection. The sumachs of the roadside thickets wear foliage of scarlet, each leaf drooping away from the fruit pyramid which rises, a deeper crimson, on the end of each upright shoot. The foliage and the fruit together make a colour harmony that is dazzling, indeed.

In contrast with its umbrellas of red leaves are the scarlet berry clusters of the flowering dogwood. This tree has the habit of snuggling up against the trunk of large forest trees and reaching its white flowery arms out to us in spring. How wonderful they are, on the edge of the

woods, with the green leaves of the larger trees making a background for their flowers! In the autumn the same surprise awaits us, when under a towering tree with yellow or russet foliage, the dogwood leaps up like a scarlet flame, against its dark background, holding straight out its platformed branches of red leaves, tipped with berries, like rubies, set on the upturned twigs.

Often the trees are stripped by birds before the berries are ripe. It is in woods where the trees are numerous that we shall find the fruit reaching its perfection of ripeness and colour.

Among the trees that turn to purple in the autumn we may name the white oak and the ashes. Many oaks turn from green to russet, without showing any red or yellow. The lindens and the tulip trees and the beeches turn yellow; so do the poplars and willows, the hickories, and walnuts. Up and down the street you may see the yellow crowns of the silver and the Norway maples, and on the lawns the white birches have also turned to gold. The deepest red is on the black and red oaks. The brightest red is on the scarlet oak.

It is not fair to charge Jack Frost with all the gay colours of the autumn woods. Perhaps I should say, rather, that he does not deserve all the credit people give him for painting the

The flowering dogwood covers its bare branches with blossoms in May

Flowering dogwood, in flower and fruit, the winter flower buds and alligator-skin bark

landscape with the sunset glories of the dying leaves. The cause is the ripening of the leaves themselves, as I have already explained. Frost may hasten the process, but if a heavy freeze comes in September, before the leaves have coloured, we lose our chance for autumn colouring that year. The leaves drop as if scalded, and the trees lose their leaf pulp, which they had expected to withdraw and save for future use. A long dry autumn of warm days and mildly frosty nights produces the finest succession of colours.

Countries that have a more moist, warm climate than ours, do not have the vivid autumn colours that we enjoy. England, and the countries of Western Europe, are like our West coast in lacking the colour changes that make October for us the most glorious month of the year. Our New England woodlands and the forests of Canada are matched in brilliancy by the wooded slopes of the Swiss Alps, and the forests along the Rhine and the Danube. In our Southern states there is little or no change that comes to the foliage towards the end of the year. The leaves on the trees of Florida are lazy in falling. They wait until pushed off by the swelling buds in early spring. Many trees that shed their leaves promptly each autumn in the Northern

states, gradually become evergreen in the Southern parts of their range. The longer a tree carries its leaves, the more battered and worn they become. A tree with fresh, new leaves mingling with old ones is not a pleasant object, at least to Northern eyes. This is the way most trees in the South look in spring.

If we should travel the world over, and see the trees of many lands, in spring, in summer, in autumn, and in winter, I believe we should all come back to the clean, beautiful mixed woods of our north temperate zone, and declare that these woods are the most beautiful in the world. In the dead of winter, they are budded full of promise. We learn to love them as well in this period of rest as we do in the beauty of their spring flowers, or in the glory of their autumn colouring, or in the steady growth of summer.

Each leaf is nurse to a bud that is growing between its base and the twig. Find these little buds on any tree with broad leaves. A part of all the food that passes that way stops to feed this growing bud; and in the late summer the twig provides for the future welfare of all its buds. The thrifty tree withdraws the green pulp from its leaves, before it lets them fall. A store of starch is put away in the twig, close to each bud. This is the food supply which will

be used in the spring to enable the bud to open and spread its young leaves, or its flowers, in a surprisingly short time.

When the worn-out leaf has been drained of all of its pulp, the tree lets it go. It has done its work, and given up its pulp to be stored in the twig for future use. It seems as if the tree knows that, with the coming of cooler weather, growth must stop; that the tender leaves must die when frost overtakes them. So it is a frugal habit to save all of the good green leaf pulp, and to cast off only the dry leaf skin.

TREE STUDIES IN THE WINTER

TREES WE KNOW BY THEIR BARK

HUNTERS and foresters who spend much of their time in the woods learn to know trees by name through long acquaintance. In the dead of winter, the framework of a tree may be enough to recognise it by. Where trees are crowded, this sign is not to be depended upon. The bark is often a guide to the tree's name. The forester will tell you that the bud is the surest sign of all. The bark is one of the best signs.

It is not the easiest thing in the world to learn to know trees by the bark alone. To the beginner, so many trees with dark, furrowed bark look strangely alike, although the trees are not even related to each other. The foresters began with trees that have peculiar and easily recognised bark. So we shall begin here, and hope that the hard cases will gradually become easier.

Every tree wears a garment of bark from the ground up to the utmost twigs. The thinnest bark is on the youngest branches. The thickest is on the trunk.

Begin with the white birch upon the lawn. The bark of this tree is made of thin layers;

the outer one shining like white satin. It breaks and tatters, and peels off around the trunk. Three-cornered patches of black are found under each branch, and others on the trunk show where branches once came out, but were broken or cut off.

Do you notice narrow, horizontal slits of different lengths on the birch bark? These are breathing holes that let the air in to the layer under the bark. Spongy, porous substance fills these slits, but allows the air to pass through. At the lower part of the trunk the satiny outer bark is shed, leaving dark under layers, rough and checked into irregular blocks. As the tree grows older, the trunk becomes rougher and darker, but the branches always show the kind of bark that the little tree wore.

In the Northern woods the white bark of the canoe birch is stripped from the trees in layers as thick as sole leather. Out of these the Indians once made their bark canoes. Now the same material is used for making all manner of trifling souvenirs to sell to tourists. A square of this thick bark, cut on the smooth side of a trunk, may be split into a great number of thin sheets. This the camper uses to write letters upon, and it is a beautiful and fitting substitute for note paper, when one is camping out.

We recognize birches by their silky, tattered bark

The beech trunk is clothed in smooth, pale grey bark

It is a great pity that so many beautiful trees are girdled and killed to supply the needs of camping parties. If the bark were stripped but part way around it would not kill the tree.

The yellow birch has a silvery yellow tint in the outer bark, which curls back in ragged ribbons until the tree gets old. The red birch writes its name in the rusty red colour of its papery bark, which splits into tatters in true birch fashion, and flutters the ragged ends from each branch throughout the year. The black birch has no tattered ribbons flying, but wears a close, smooth, black bark, with the narrow slits that all birches show. As the trunks grow larger the surface checks into irregular plates, separated by furrows. It is called the cherry birch, for the bark is like that of cherry trees.

The sycamore has bark which is different from that of every other tree. Indeed, it is by the bark that we recognise this tree. The tall trunk looks as if it were blotched and streaked and spattered with whitewash, from the trunk to the topmost limb. The bark is continually dropping off in thin, irregular plates, leaving smooth whitish patches of an under layer exposed. After sycamore trees grow older, the bark of the lower portion of the trunk stops shedding. Fine-checked plates of rusty brown cover this oldest

portion. But even on the oldest and largest trees, the pale blotches are seen in the branches and we shall never mistake the name of the tree.

The shagbark is one of the rugged and shaggy trees that boys find hard to climb without tearing their clothes into tatters. The bark gives the tree its name. Thin, narrow plates, close-woven and tough as sole leather, seem to be attached very loosely to the body of the tree, but if you try to pull off these narrow strips, you find their hold is very firm. Often they are attached at the middle, and spring out at both ends.

An old shagbark tree is a picturesque figure, as it lifts its bare arms up toward the wintry sky. The trunk is straight, but the branches are full of angles. Yet, with all their rigidity, these limbs have an expression of strength, if not of grace, and the tree's head is usually symmetrical, and always full of character.

A young hickory has smooth, close-knit bark like that on the branches of the older trees. Gradually the growing trunk becomes furrowed, and the peculiar splintering and splitting of the bark is seen only in trees six inches or more in diameter. By the time the tree is old enough to bear nuts, it has built itself a formidable fence that boys must climb over with much hard work and

The loose, stripping bark gives its name to the shagbark hickory

Warty bark of hackberry

Silky bark of black birch

Close, sinewy bark of hornbeam

many a scratch, to get up among the branches and shake down the nuts.

The tasteless pignuts grow on a smooth-barked hickory tree, very easy to climb, but the bark of the little shellbark hickory is the guide-post that leads to the trees where the sweet-flavoured hickory nuts grow.

The close-knit, grey bark of beech trees hardly needs to be described. The temptation to cut initials on beech trunks is more than folks with pocket-knives can resist. No matter how many fine trees there are in a beech grove near town, they are scarred all over with letters and hieroglyphics as far as hand can reach. The tree never covers these wounds. Though they do not cripple it, they mar its beauty painfully.

A little further from the haunts of picnic parties, we shall come upon beech woods that have not thus been abused by thoughtless jack-knives. From the ground, far up into the high tops, a close, beautiful garment of ashy grey bark clothes the tree. Saplings of all ages grow up among the big trees, for beeches grow in colonies. A soft radiance from these many pale tree trunks seems to lighten the woods paths, overshadowed by the dense foliage of the tree tops.

It is said that beech trees die when they come into contact with civilisation. Fine beech woods

are included in additions to towns; you will see the great trees die when lawns and gardens are made about their roots. In the outskirts of Indianapolis there are noble beech trees, but they are dying, as the city grows around them.

The copper beeches and the cut-leaved and weeping beeches have the same close-knit bark as our native tree, but it is not grey, but dark brown. These fancy forms are varieties of the European beech, one of the principal lumber trees of the Old World.

The bark of this tree played an interesting part in the early history of the human race. Long before the European tribes had written languages, they sent messages from one to another. These messages between tribes, friendly or warlike, were written in hieroglyphics, cut into the smooth surface of beech bark, and messengers carried them back and forth.

Sheets of beech bark, as well as birch, made the walls and roofs of the huts in which people lived. Their boats and various household utensils were made out of beech wood, which is so close-grained that vessels made of it hold water without leaking.

Another American tree with bark like the beech, but darker grey, grows always, by preference, with its roots in wet soil. It is a little

tree, with rigid, horizontal twigs, that form a flat tree top. This is called the blue beech, and its trunk does often have a bluish cast. It is also called hornbeam, for its wood is so hard that it was used in the early days to make the beams which went across the horns of the oxen. This is the part of the ox yoke which is the most subject to wear. Ironwood is another name that describes the hard wood.

We shall notice that this tree has not a regular cylindrical trunk like that of a beech. Strong swellings, that look like muscles, are seen, especially where the trunk branches into the main limbs. Have you ever noticed the arms of a blacksmith, or of an athlete? How the veins and muscles stand out when the arm is in use! Just like them are the irregular swellings that course up the trunk of the hornbeam, and out into the limbs.

The hackberry is a handsome shade tree, which might, at first glance, be mistaken for an elm. The bark is different from that of any other tree. Once we see a hackberry, and learn its name, we will never mistake it again. The bark is light brown or grey, and finely checked by deep furrows. The ridges between bear strange, warty outgrowths. Look for these warts among the small branches. The twigs are smooth, but

back a little way the warty eruptions begin, and become more prominent as the limbs thicken and approach the trunk. Sometimes the limbs have these warts so close together as to form continuous ridges.

Another tree with warty bark is the sweet gum. The negroes of the South call the tree "alligator wood," because the lower part of the trunk is broken by furrows and cross-furrows into horny plates like the skin of an alligator. From the red-brown trunk up into the grey branches, there is a change in the character of the bark. The fissures usually run lengthwise, and the bark rises in thin ridges on each side of the fissure. These ridges become thin as knife blades on the smaller twigs, which also have a sprinkling of small warts.

A sweet gum is very rugged looking in the dead of winter, with its warts and ridges breaking out on each limb. We know it by this sign alone, but are doubly sure when we see the seed balls dangling from the twigs. The sycamore, blotched with white on trunk and limb, also carries a load of dangling seed balls throughout the winter. There is no danger of confusing these two trees, for the bark of each is so distinct.

A little tree with alligator skin bark grows

Warty, ridged bark of the sweet gum, the swinging seed balls and winged seeds

Blotched bark of sycamore, and its seed balls that hang all winter

North and South, and chiefly in the eastern half of the country. This is the flowering dogwood, whose grey bark breaks into small squarish plates. There is no such ruggedness in its trunk as there is in the sweet gum's, for it is always a little tree, and the bark corresponds in its checking to the tree's size. When we see this peculiar type of bark in the winter woods we may look also for little flattened, box-like flower buds, each enclosed in four scales. We shall also find the twigs set opposite, and with these three signs be sure we know the tree.

A little tree, no larger in girth than the dogwood, but often taller, has bark that strips and loosens somewhat as the bark of the shagbark hickory does. This is the hop hornbeam, one of the ironwoods. Its bark strips are always thin and narrow, no matter how old the tree becomes. It is never as loose upon the trunk as the shagbark's. The great buds and stout twigs of the hickory are entirely different from the slender spray and the very small buds this ironwood wears in winter. We may find on these twigs some remnant of the hop-like seed clusters which give this little tree its name, hop hornbeam. Inside its shaggy bark the lumbermen find wood so hard that it is very difficult to work, and when made into tools it lasts almost forever.

When we have learned to know at sight a dozen trees by their bark alone, we are ready to go further. A great many trees with furrowed bark like chestnuts and elms and maples, are not so distinct as those already learned, and we must study the tree's form, its winter buds, the arrangement of these buds, and the shape of the leaf scars in connection with the bark, in order to be sure we know the tree's name. The chestnut from which we gathered so many nuts last fall, and whose furrowed trunk we saw at every visit, we come to know through this familiarity. The trunks of other chestnut trees look like this one, and though we may not know just how we do it, we have added the chestnut to the list of trees we recognise by their bark alone. The sugar maples which we tap in spring for their sugary sap, have dark, furrowed bark, not very distinctive. And yet, by going from tree to tree, emptying the sap pails, we gradually learn to recognise the bark of the sugar maple, and add it to our growing list.

Trees do not change their clothes, and they do not move away. Day after day, if we use our eyes and notice what is going on in the tree tops, as the seasons follow each other, we come to know our trees by name; we recognise them in winter by their bark, and by the framework

The Lombardy poplar stands like an exclamation point in the landscape

The live oak of the South is usually hung with long skeins of the weird, grey Spanish moss

of their tops, in summer by leaves and flowers, in autumn by their changing colour and by their fruits. It is not hard work for those who love trees. It is like getting acquainted with other neighbours whom we are glad to count among our friends.

TREES WE KNOW BY THEIR SHAPES

The life of every tree depends upon its success in holding its leaves out into the sunlight. The tree which exposes the greatest amount of leaf surface to the sun makes the greatest growth. The shape of their tops is a character in which trees differ widely. We shall come to know many of them in winter time better than in summer, by the distinct shapes revealed when the foliage is gone. In any bare tree, the purpose of all of the branching and branching again, is plainly seen. Each twig and branch reaches out toward the outer surface of the dome, or pyramid. Here the buds in winter are waiting to open, when spring comes, into leafy shoots. These will cover the tree top with a dome of green greater than the one of the previous summer. Their work through the growing season will lengthen every branch and every

root, and add a layer of wood under the bark of trunks and branches and roots.

The most remarkable tree shape is that of the Lombardy poplar. The tall trunk is clothed with many short, close-branched limbs, which do not spread, as in ordinary tree forms, but grow upright, so as to lie almost against the main trunk. The upper branches are overlapped and crowded by those below them, and so on down the trunk. The result is a tree shaped like a capital I. In summer time, the heart-shaped leaves cover the twigs on the outside of this spire, but the beauty of the tree top is marred by the dead branches which have been smothered by the crowding.

A young Lombardy poplar is handsome as it stands covered with its twinkling leaves. It grows rapidly, and is especially striking and effective in clumps of round-headed trees. It is like an exclamation point. Architects always like to have a few of these trees dotted about the grounds to keep company with tall chimneys and distant church spires. There is no shade under trees of this form, though miles of them are planted along roadsides where they stand like tin soldiers, all alike. The older trees look very ragged, for they are unable to shed their dead limbs, and as old age comes on they

send up suckers from the roots that form a little forest around the parent tree.

Scattered over fallow fields of worthless ground, the red cedars are allowed to grow. They are the evergreen counterparts of the slim Lombardy poplars. Sometimes the red cedar broadens into a pyramid, wide at the base, but we are all familiar with the green exclamation points, dotted over the hillsides, wherever birds have dropped the blue berries full of seeds.

The pointed firs with their horizontal branches becoming longer and longer towards the ground, are good examples of the pyramid form so common among evergreens. This is the shape of the spruces, and the pines, and the hemlocks, until storms have broken their branches, and taken away the symmetry of the top. The pin oak and the honey locust send out horizontal branches of graduated lengths from the central shaft, imitating the evergreens in shape.

The evergreen magnolia of the South has a dome like an old-fashioned beehive, pyramidal, and regular when it grows in sheltered places. Such a dome is the hard maple's in the North.

Some trees branch low, and their short trunks break into great limbs whose ample spread forms a dome much broader than its height. The white oak in the North and its evergreen counterpart,

the live oak of the South, illustrate this noble form. Somewhat like them, but with its dome elevated upon a tall trunk, is the American elm with the fan top. The lines of the elm branches are all curves from the arching limbs that rise out of the trunk to the flexible twigs which droop at the extremities of the branches. The dome of a white oak is made of angular limbs. Even the twigs are likely to be crooked. No one would confuse the elm with an oak.

Round-headed trees are many. Go from the apple tree in the orchard to the red and Norway maples along our streets. A great many trees find this form best adapted to spreading their leaves out towards the sun. Many oaks and ash trees, the hickories and birches, and the beeches have widely spreading limbs forming tops that are oblong in shape. There are trees so irregular in habits of growth that we shall never know them by their forms alone.

The winter is the best time to study tree shapes, for then the framework is revealed. The trees to study are those which stand apart from others, so that they have been able to take their natural shapes. These we shall find growing on the streets, and in yards, and parks, and in open spaces in the woods. Where trees crowd each other in growing, their branches chafe and clash

Fruiting branch of the cockspur thorn

Clustered thorns on trunk of honey locust tree. Flowers and foliage of the black-locust

in storms, destroying the buds and leaves, and bruising the tender bark. Such limbs die of these injuries, and the whole shape of the tree top is changed by its losses.

It is hopeless for lower limbs to live in a dense pine forest. The top branches form so thick a wall of shade that lower branches die from lack of sun. It is the same with broad-leaved trees. In any dense woods, the trees stand bare as telegraph poles, lifting small heads of foliage at the top, and competing there with their neighbour trees for sun and air. It is only when set apart from other trees that a trunk can keep its lower branches hale and strong as those at the top.

The weeping habit gives us some strange tree forms. The Camperdown elm forms a shady summer-house on many a lawn by arching limbs which droop to the ground on all sides of the main trunk. The weeping mulberry has the same habit. Weeping birches and willows have such light foliage, and such fine, flexible twigs, that they look like fountains of green as they stand among the other trees.

All weeping trees are made by grafting in the nursery rows. They are not grown from seeds, and it is not true that they "weep" because of being planted up-side-down! This preposterous notion is not uncommon.

TREES WE KNOW BY THEIR THORNS

In winter time, the bare limbs of trees reveal many strange secrets, which the leaves cover up in summer. Some trees we may know by the thorns they wear.

The honey locust scarcely conceals in summer the three-branched thorns, for which it is famous. These thorns are twigs, but they rarely bear leaves. Each is sharpened to a needle point, and highly polished. Sometimes it is single, oftener with a main thorn and two side branches; sometimes short, but often reaching over a foot in length, and growing stronger and more wicked-looking with age. Sometimes a honey locust has a crowded group of these thorns growing out of the trunk and large limbs. Once in a great while a honey locust is thornless, growing wild. From such trees a thornless variety has been developed. It is, therefore, possible to obtain from nurserymen trees of this variety.

The unbranched spines of the osage orange trees make it a formidable hedge plant, and no fences are needed where green barriers of these trees grow. Each shining leaf has a spike at its base, stout and sharp as a needle, and strong as steel.

Two spines stand guard at the base of each leaf of the yellow or black locust, and each leaflet has two little spines of the same type. The basal spines remain after the leaves fall, so that in winter we shall find these pairs of sentinels guarding the leaf scars up and down the ridged twigs. On the thicker stems the thorns are larger, and the tree is thus well-armed and able to do duty as a hedge plant, when thickly planted.

These thorns come off with the bark, hence they are more properly called prickles. They are not rooted in the wood of the branch as the thorns of the honey locust are, but they belong in the class with rose and raspberry prickles, which are mere outgrowths of the bark.

The hawthorn trees have single spines, some long and curved, some short, some branched. All are rooted in the pith of the twig that bears them; therefore, they are not prickles, but true thorns.

The wild plum trees have a strange habit of ending their shoots with thorny tips, as if the branches needed such defence against browsing cattle. Certainly these stunted, sharp-pointed twigs are useful as weapons of defence to the little trees that grow slowly in poor soil, and are sufferers from poverty and abuse. Perhaps it is their hard luck that makes them crabbed and thorny. Wild apple trees show the same tend-

ency to have thorny twigs. The same little trees, transplanted to mellow soil, grow soft and leafy twigs, and abandon the carrying of weapons.

Hercules' club is a tree which beats the ailanthus at its own game. Stems ten feet high and two inches in diameter at the base sometimes shoot up in a single season. These clubs of Hercules are covered with spines as thickly set as on a gooseberry bush, formidable and vicious, though only skin deep.

On account of its tropical growth, this tree is planted for ornament in gardens where there is room. Its leaves are wonderful. They come out with a rich, silky, bronze sheen in spring, and when they reach full size are often four feet long, and more than half as wide. Each one is branched and branched again, and ends in a multitude of small oval leaflets. These giant leaves sway in the summer winds, giving the tree the grace of a tree fern. In late summer a great pyramid of bloom rises above the foliage. Purplish berries, which succeed the flowers, make a fine showing in fall and winter, when the leaves have turned to red and gold.

We dare not touch this spiny tree, but we may come close and admire its wonderful crown of umbrella leaves, the biggest by far borne on any tree outside of the Tropics.

THE NEEDLE-LEAVED EVERGREENS

In our town and in our neighbourhood most of the trees drop their leaves before winter comes, and stand with bare limbs for several months. Here and there, however, a single tree stands, wearing the same green leaves it wore all summer. Everybody knows this tree as an evergreen. It belongs to a group of trees strangely different from those around it which have shed their leaves. Let us see how it differs from them.

Take the one that is nearest to you, and pull down one of its leafy, green branches. The leaves are like green needles, stiff, sharp-pointed, with waxy resin on the brown twigs, that makes your fingers sticky. Up in the tree tops strange oval, brown cones are hanging. Underfoot, a carpet of dead needles lies thick upon the grass, and cones, with their overlapping scales spread much wider than those upon the tree, lie about. Squirrels have gnawed some of these scales away, leaving a central spike like a cob from which the corn has been shelled. Little green cones, fat and waxy, no larger than your thumb, are seen near the tips of some branches. You can see the scales overlapping each other in these,

even though they seem to be grown solidly together.

If we walk through the village or the city in which we live, and stop under each evergreen tree we come to, we shall find nearly all alike in these two points: they have needle-like leaves, and they have cones. The evergreens with needle-like leaves, and cones on and under them, belong to four evergreen tree families, whose names every one would like to know. These four evergreen families are named pine, spruce, fir, and hemlock, and they are planted everywhere. But few people are very sure they know one from another. It is perfectly right to call them all evergreens, or conifers, which means cone-bearers. These names include all the four families. But it is common for people to call a spruce, a pine, or a hemlock, a spruce, when the truth is that one may very easily know these trees apart.

Let us begin with the first needle-leaved cone-bearing evergreen we meet. To find out whether this tree is a pine, a spruce, a fir, or a hemlock, we must ask the tree some questions. It will answer them. First: "Are your needles set *one* in a place on the twig, or are they in groups, or bundles, of *more than one* at a place?" Pull down a twig and look sharply for the answer. Suppose there are the leaves in pairs, or in threes,

or in fives, each bundle or group growing out of a single point on the twig. The answer is: "Not single, but in bundles, more than one at a place." Towards the end of the shoot you will find a brownish or silvery sheath binding the leaves into bundles. Further back, this sheath may be missing, but the number of leaves in the bundle remains the same for some distance back from the end of the shoot. The leaves begin to fall from the bundles farthest from the tips, and therefore old. If two leaves is the number in a bundle, there are never more than two, young and old. If three is the number, you will find only threes. If five is the number, then you will rarely find fewer than this in any bundle.

All the trees with more than one leaf in a bundle are pines. All of the rest of the needle-leaved evergreens have a single leaf at a place upon the twig. They are the spruces, firs, and hemlocks. Let us go and look for them.

The very next evergreen we come to we must put the same question to: "Are your leaves single, or are there more than one in a bundle?" Suppose "three in a bundle" is the answer; we recognise the tree as a pine, and pass it by.

Across the street is a tree of different shape, though an evergreen and a conifer. We see

the long cones hanging from its drooping branches, especially near the top of the tree. Cross over and examine a twig; the needles are short and sharp-pointed, and they are set singly in spiral lines on the twigs. Every leaf sits on a little shelf, or bracket, that stands out from the twig. Pick up a dead twig under the tree. The leaves are gone, but these little brackets in spiral rows wind around the twig. They are horny and sharp, and would tear your fingers if you drew the twig quickly between them.

Notice that the little brackets are angled at the top. Pick up a dead leaf and notice the shape of its base. The leaf itself has angled sides. Roll it between your thumb and finger. It has three or four sides, and at least three sharp angles.

This is a spruce, and the signs by which we know it are the brackets on the twig, the thick, sharp, three- or four-angled leaf, and the stout twigs, to match the stout leaves.

The next needle-leaved evergreen with cones we meet we may hope will turn out to be a fir or hemlock, but the chances are that its twigs will show two, three, or five needles in a bundle. What shall we call the tree? A pine, of course, and pass it by. We need ask no further question.

The next tree has stiff twigs with brackets, and stout, stiff, angled and pointed leaves. Cones hang down upon its branches. We recognise a spruce, and go on.

Over yonder is an evergreen which waves a featherly spray of very slender twigs. There is scarcely a breeze stirring, and yet the tree is all a-tremble, and its drooping branches carry a load of pretty little brown cones. Turn up a branch, and you notice that the leaves are all silvery underneath. They are single on the twigs, so this is not a pine. They part and lie flat, a row on each side of the twig. This is very different from a spruce whose leaves stand out all around the twigs. These sprays are flat, each like a feather. The leaves are soft, not stiff. They are blunt, flat, and each has a tiny stem. The twigs are like fine wire, they are so slender. The leaves are mounted on brackets, just as the spruce leaves are, but the brackets are much smaller, to match the daintier twigs and leaves.

It is a hemlock tree. The tiny leaf stem is the thing which sets it apart from all other needle-leaved evergreens. Take a good look before you go, at the leaf itself, at the slender twigs, with their little brackets, at the shining upper surface of the flat leaf and the silvery lining that makes this tree so lovely as the wind lifts the flexible

branches. Pick up a handful of dead leaves, and notice that though dead and brown, they show the flat surface with a middle ridge on the under side, prolonged into the short leaf stem. The pale lining is not so distinct now.

One tree family remains of the needle-leaved, cone-bearing evergreen. That is the fir, the Christmas tree, and its close relatives. Not often do we plant our native fir, because the trees are not as handsome, nor as useful as pines, spruces, and hemlocks. We may walk far before we find an evergreen which does not turn out to be a pine, a spruce, or a hemlock. However, it is near Christmas time. The little firs will be brought into market in sufficient numbers to supply a Christmas tree to every house. This is our chance. We will go to market, and look at these little trees that stand together, with their limbs trussed like fowls, ready to be baked. This is for economy of space in shipping.

The clean, pungent odour of balsam comes from the bleeding stub, and we see tears of the whitish wax wherever the bark of a twig or branch is bruised. These are balsam firs. They have their name from this fragrant, sticky resin that leaks from their veins.

First, as to the leaves. We find them single and spirally arranged, as in the spruce, but there

are no brackets on the twigs. Pull off a leaf and the twig is smooth. The leaves are blunt, but flattened, and on most of the twigs they spread, feather-like, on two sides. There are more of them, however, than on the hemlock spray. They are white-lined, like the hemlock leaves, but there are no little leaf stems. The twigs are stouter than those of the hemlock, resembling the spruce twigs in size, but they lack horny little leaf brackets which are so prominent on spruce twigs.

One reason that spruce trees make poor Christmas trees is that the leaves fall so soon. Almost the day after Christmas the floor is scattered with them. The fir trees keep their leaves for weeks. This little bracket makes all the difference. Fir leaves seem to be fastened right into the twig itself, and made thus more secure.

If it chances that you find a fir old enough to bear cones, you will see another very distinct trait of this family. The cones are held erect on the twigs; the cones of pines, and spruces, and hemlocks hang down. If you are fortunate enough to find a fir tree growing, and old enough to bear its fruit, these upright cones will tell you the tree's name before you come near enough to look at the leaves, and to see if the twigs are smooth.

THE FIVE-LEAVED SOFT PINES

An evergreen with needle-like leaves in bundles, two to five leaves in a bundle, is a pine. These bundles are usually bound with a thin, papery sheath at the base, and set in spiral rows that wind around the twig. The leaves in the newest sheaths are nearest the growing tip of the shoot. Here we shall find the leaves shorter, some so short that they have not yet got outside of their sheaths. The silky covering hides them, as the bud scales on other trees covered the undeveloped shoot with its flowers and leaves, wrapped in the winter buds.

The kind of pine depends upon the number of leaves in a bundle. This is the first thing to find out when we undertake to determine the name of a pine tree. All of the vigorous young shoots have bundles that do not vary in number of needles. Further back on the limb are leaves more than a year old. The sheaths are shorter, or have fallen away entirely. Now the number of needles in a bundle begins to be uncertain. We find bundles that have fewer needles than those on the younger wood. This is because the older leaves are falling. Finally we reach a point where the twigs are bare. On white pine

shoots it is easy to find leaves that are five to seven years old.

"Soft pine" is a lumberman's term. Carpenters use it, so do all people who work in wood. It means that the wood of a certain group of pines is soft and light, and the sap is not gummy. Any boy who has cut kindling wood knows what a joy it is to whittle soft pine. Until a few years ago, this was the wood out of which boxes of all sorts were made, and it was the only kindling wood we had. Now things are changed. Much box lumber is made of poplar and other soft woods, which do not split as easily as pine. This means that soft pine is getting scarce, and is too valuable to use where cheaper woods will serve.

THE WHITE PINE

The white pine has the softest, most hair-like leaves in the whole pine family. Five needles are in each bundle, and each is delicate and flexible. When the wind blows through the top of one of these five-needled trees, the end shoots nod like plumes. The tree sends up a straight shaft sometimes to the height of nearly two hundred feet, and whorls of branches, five in a place, form regular platforms extending horizontally

from the trunk. Each of these sets of branches counts a year of the tree's life; for the end bud lengthens the trunk, and at the same time, five buds that surround it grow out into horizontal branches. It is easy to count the age of a young white pine, by beginning at the tip, and counting downward. We could do it with large trees, except that the lower branches die, and at length are lost. The bark heals over the scars left where they fell, so the count is lost when we reach the point where the branches stop. The white pine is slow to shed its dead branches.

In the woods of the Eastern half of the United States any five-leaved pine that we meet is a white pine. Before we are near enough to count the needles in a bundle, we may count five branches at a whorl around the trunk, and this determines the name. Beautifully regular pyramids, the little trees are. In old age these pines lose symmetry by the loss of limbs, and become very rugged and picturesque. A white pine tree, crippled by two or three centuries of struggle with winds and lightnings, is a noble figure. The plume-like branches soften its rugged outlines, and the sombre blue-green of the older leaves is brightened by the fresher colour of the new ones. The upper half of the tree is hung with slim cones whose smooth, thin scales spread wide in

the autumn of their second year to let the winged seeds go.

In spring the clustering catkins of staminate flowers look like yellow cones on the ends of the pale yellow-green shoots. The wind shakes an abundant supply of golden dust out of these pollen flowers, then lets the fading catkins fall. The pistillate flowers are pinkish-purple and almost hidden, just back of the tips of the upper twigs. They are cone-shaped, and they part their scales and stand erect to catch the pollen as it drifts through the tree tops. The flowers on each scale require a grain of pollen each, in order to set seed. When its flowers are fertilised the cone closes its scales tight, but they stand erect all summer. In the autumn they are green and fleshy, and they turn downward. In winter we shall see among the swaying branches of these pines, the green, half-grown fruits, and further back, on wood a year older, the brown, full-grown cones with their scales spread. These cones often curve slightly. The largest of them may be ten inches long, but the average cone is little over half that length.

The lumbermen have stripped the white pine from the Eastern forests until there is very little left. Many states are planting this valuable timber tree, to restore the forests that wasteful lum-

bering, and forest fires have destroyed. Thousands of young trees grown in nursery rows are transplanted to beautify home grounds and parks. We shall find no difficulty in discovering white pine trees, even though no forest near us has a specimen left. It is one of the commonest pines to be planted in cities and villages. It is the only five-leaved pine that will grow successfully on this side of the Rocky Mountains.

THE GREAT SUGAR PINE

All along the coast mountains from Oregon to Lower California, a five-leaved soft pine grows whose size makes our Eastern white pine seem like a dwarf. In that far country of big trees, it is one of the giants. I had read of these trees which grow to be over 200 feet in height, with trunks six to ten feet in diameter at the ground, but figures do not give much idea of the truth. I first saw the groves of sugar pines miles ahead of us, as the stage climbed the foot hills of the Sierra Nevada mountains. We were on the way into the wonderful Yosemite Valley. The scrawny, grey, digger pines, with cones as big as a man's head, grew on the lower foot hills. Next came the great yellow pines, and still higher

Hemlock cones are small; those of Norway spruce are four or five inches long

Pine twig with cones, young and old, and clustered staminate flowers

up, the grand sugar pines, along the highest level of the stage road. They stood oftenest in close ranks so that their tops were small, because of the crowding. And here they had stood for centuries. The road was no wider than the broad stumps of some that had been cut down, and their prostrate trunks were longer than any log I have ever seen before. I remember calculating that the round dining table at home could be set upon this stump, and all the family seated round it with no danger of their chairs being too near the edge. The standing trunks seemed like great builded columns, too large for real trees to grow. Their feathery, dark green tips reached nearer to the sky than any trees in Eastern forests.

Under these pines old cones were lying. They were big, to match the trees. Twenty inches the longest one measured, with scales two inches long, and plump seeds as big as navy beans. Far off in the tree top the hanging cones looked moderate in size. We could just see the green, half-grown cones nearer the ends of the branches, for this Western white pine, like our Eastern species, requires two years to mature its fruit.

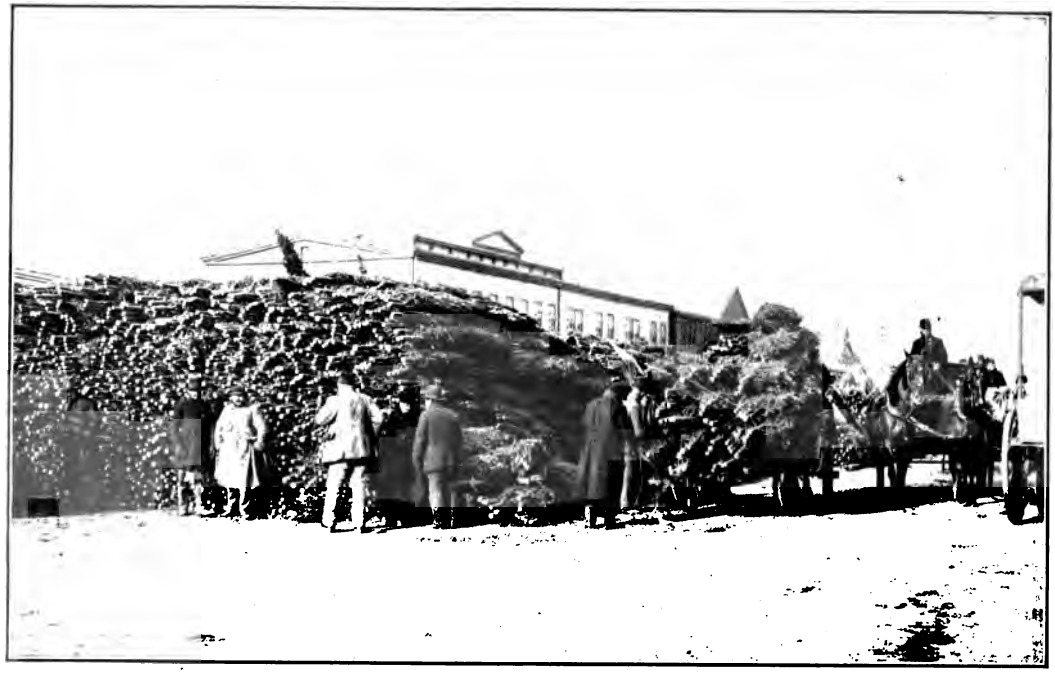
"Why call them sugar pines?" I asked the stage driver. He pointed to some drops of resin-like substance on the scales of the cone I held in my lap. "Taste it," he said. I did, and it was

sweet, with somewhat the flavour of maple sugar. Crystals of this sugar come from wounds in the bark, and from the ends of green sticks when burning. The sap is quite as sweet as that of maple trees, but one is soon surfeited in eating the candy-like substance.

The stage driver told me that a lumberman could cut $5,000 worth of lumber from one of these sugar pine trees. No wonder they think that it is a burning shame for the government to reserve these noble woods of the Yosemite tract "just to be looked at." Fortunately for us, and for the people of the whole country, some thousands of acres of magnificent forest are reserved on those Western mountain slopes, where they are safe from the lumberman's axe. If we cannot go to see them this year, perhaps we can fifty years hence. They will still be standing, still growing, these noble remnants of the grandest forests of any country. Specimens of what Mr. John Muir calls "the largest, noblest, and most beautiful of all the seventy or eighty species of pine trees in the world."

THE NUT PINES

A group of soft pines, with fewer needles than five in a bundle, grows on the Western mountain



Thousands of little balsam firs supply the market with Christmas trees

In these tall white pine trees Nathaniel Hawthorne built an outdoor study, where he wrote undisturbed

slopes. Small trees they are, which have to struggle hard against the winds and storms, and with the scant moisture of the desert air and soil for a bare living. They are very interesting because of the fact that they have nuts, rich, sweet, and nutritious, under the scales of their cones, and these nuts are important items in the food of many Indian tribes of the West.

The first is the four-leaved nut pine that grows on the barren mountain slopes of Southern and Lower California. It is a desert tree, rarely reaching forty feet in height, and this only in the most favourable situations. The foliage is pale sage green. No other pine has four leaves in a bundle. Its nut-like seeds are rich in oil, starch, and sugar. Without them the Indians of Lower California would probably starve. In Riverside County the tree is common at 5,000 feet above sea level. It has a regular pyramidal head, when young, becoming low, round-topped and irregular when very old.

Another piñon, but this one with a bushy, broad top, and often considerably taller, grows with the four-leaved pine on the mountains of Lower California, and northward along the canyons and mountain slopes of Arizona. The short leaves are dark green, and there are but two or three in a bundle. The seeds are plump, and rounded, or

angular. The upper side is brown, the lower side black, and each has a pale brown wing.

A third nut pine, or piñon, two- or three-leaved, grows on the eastern foot hills of the outer ranges of the Rocky Mountains, on both sides of the system. Forests of it are found on the high plains of Colorado and Arizona. It sometimes grows large enough to be used for lumber. The nuts are half an inch long, and have thin, brittle shells. They are gathered by Indians and Mexicans, and may often be bought in the markets of Colorado and New Mexico.

The one-leaved nut pine seems to belong with the spruces and firs, and other single-leaved evergreens, but there are frequently two leaves in the bundle, and there is a little scaly sheath at the base. The grey-green leaves often hang on for ten or twelve years. The winged nuts are over half an inch long. The wood furnished fuel and charcoal to the smelters in the mining regions, and the Indians of Nevada and California harvest the nut crop.

Every autumn when we are going for chestnuts and hickory nuts in our Eastern woods, we may think of the Indian families who leave their homes in the lowlands, and climb the mountain slopes to gather their nuts which are their staff of life. If we should miss our nutting excursion,

it would make no vital difference in our lives during the coming winter. Our nuts are not a serious part of the provisions of the household. But with the Indians, to miss the nut pine harvest, means to have no bread for the winter that is coming.

Mr. John Muir, who has often lived among these stunted upland forests, and seen the Indians gathering the nuts and using them later as food, tells us many interesting things. The trees of the one-leaved nut pine are low, like old apple trees, and full of cones. The Indians get long poles, and beat the cones off the trees, then roast them on hot stones, until the scales open. Then they shake out the nuts, and gather them in baskets and bags to carry home. These nuts are eaten raw or parched on hot stones. These are the easiest and simplest ways. But the best and most palatable form in which they are prepared costs much more time and labour. The nuts are parched, then ground or pounded into meal. This is stirred up with water, into a kind of mush, which is formed into cakes and baked. This is, in general, the way in which all pine nuts are made into bread.

The time of the nut harvest is, for the Indians, the merriest time of the year. If the crop is heavy, the spirits of the party are light. A

single family, if it is fairly industrious, can gather fifty or sixty bushels of these rich, thin-shelled nuts in a single autumn month; and with this quantity to carry home, can go down the mountains, tired but happy, knowing that their bread for the winter, and plenty of it, is assured.

THE HARD PINES

The hard pines are a group of needle-leaved evergreens, whose leaf bundles contain two or three needles, as a rule. The wood is heavy, usually dark in colour, and saturated with a resinous, gummy sap. The common name, "pitch pine," refers to the resinous wood; it is much harder to work with than that of soft pines. The most valuable hard pine forests grow in the Southern states. These are now the chief sources of pine lumber in the Eastern half of the continent. They furnish also quantities of turpentine, pitch, tar, and oil, products of the resinous sap which saturates the wood of these trees while they are growing.

One trait of the pitch pines is that they retain the leaf sheath. The soft pines shed the sheath as soon as the leaf bundle has attained its full length.

THE SOUTHERN PITCH PINES

The woodwork and floors of a great many houses of moderate cost are done to-day in Southern pine, sometimes called "yellow pine," sometimes "curly pine." The alternating bands of dark and light yellowish brown, often very much waved, give the wood an ornamental grain that is much admired. It is common and most desirable that this wood should not be stained nor painted, but given the "natural finish" which brings out the rich orange colour, and shows at their full value the wavy bands and intricate patterns that are the chief beauty of the wood. The arching timbers that support the roof of a church are often made of stiff timbers cut from Southern pines, and dressed only with a coat of oil, under which time deepens and enriches the wood's natural colours.

THE LONGLEAF PINE

The longleaf pine is one of four hard pines whose lumber is not distinguished by ordinary carpenters, but is generally called "yellow pine." "Georgia pine" ranks a little higher than the

rest. That is the longleaf, which grows over a territory much greater than the state of Georgia. This is the chief source of turpentine, pitch, and tar, as well as one of the very best lumber trees of the pitch pine group. The most ornamental wood is that with the curliest grain, and the narrowest bands of alternating dark and light colour. It grows slowly in hard, sandy soils on the damp coast plains near the Gulf of Mexico.

We shall know this tree from all other pines by the length of its needles. They are twelve to eighteen inches long, flexible, dark green, shining, three in a bundle, enclosed at the base in long, pale, silvery sheaths. They remain on the tree but two years, therefore the tree top is bare except for thick tufts of these drooping leaves on the ends of the branches. If you have never seen these trees growing in their natural forest belt, that ranges from Virginia to Florida, and west to the Mississippi River, or in small scattered forest patches in Northern Alabama, Louisiana, or Texas, you may have seen branches or small trees shipped north to be used for Christmas decorations. In the waste land that the lumbermen have cut over, in the neighbourhood of these longleaf forests, men go in early December, and cut the little trees. Saplings two or three feet high bring good prices in the Northern markets,

where holly branches, ropes of ground pine, sprigs of mistletoe, and leaves of Southern palms are sold. A little two-foot longleaf pine, standing erect, with all its long flexible leaves bending outward like a fountain of shining green, is handsomer than any palm of the same size.

The popularity of these pine shoots is growing, and those who cut them seem not to realise that they are killing the forests of the future. Trees grow from seeds which fall in the territory cleared by the lumbermen. If these little trees that Nature plants are cut as fast as they show themselves above the forest floor, how are the longleaf pine forests to be restored? It is a great problem, for a great part of the natural wealth of the South is in these lumber tracts, now being cleared at a terrific rate of speed, and the land left practically worthless when stripped.

The cones of the longleaf pine are narrow and tapering. The scales are thick, and each bears a small spine. The leaves are the distinguishing trait, and the tall, slender trunk crowned by a long open head of short, twisted branches.

THE SHORTLEAF PINE

The shortleaf pine ranks second only to the longleaf among the forest pines of the South.

It is the common "yellow pine," and "North Carolina pine" that is commonly sold from lumber yards in the North and Middle West. Its wood is almost as beautiful in the natural finish. Its leaves are short in comparison with those of the longleaf, and scarcely longer than any pines of the North. They are found in clusters of twos and threes, and they have the dark blue-green colour of the white pine, lightened by the silvery sheaths at the bases of the clusters. The leaves are soft and flexible, slender, and sharp-pointed. They vary from three to five inches in length. The cones are two to three inches long, and half as broad; the thickened scales have small spines. It takes two years to bring cones to maturity, and the old ones hang on several years. In this they differ from our Northern pitch pine.

Forests of this timber pine are scattered from Connecticut to Florida, and west to Illinois, Kansas, and Texas. They are being slaughtered by lumbermen as fast as those of the longleaf. The young trees are tapped for turpentine. In the South and East, these forests are practically gone. The lumber mills are busy in the great tracts west of the Mississippi, and below the Arkansas River, in the forests of shortleaf pine, which until recently were untouched, and too far from the markets to be profitably cut.

The shortleaf pine will reforest the old areas, and spread over a widening territory, if only it is given a chance. One hundred years is enough time to restore a forest,—to grow a crop of these trees. Young ones spring from the roots of old trees, a habit not at all common among pines. Let us hope that before the Southwestern forests are gone, new ones east of the Mississippi River will take their places, so that the shortleaf shall not disappear from the lumber markets as the white pine of the Northeastern states has done.

THE CUBAN PINE

The Cuban pine or swamp pine of the South, with stout green leaves eight to twelve inches long, in twos and threes, is not confused with the longleaf nor the shortleaf, for its leaves are intermediate in length between the two. This beautiful pine grows in forests that skirt swampy coast land. Its leaves are carried two years, so the trees have dense, luxuriant crowns of green, and are more beautiful as a part of the landscape than any other forest pine of the South. The wood of the Cuban pine is not distinguished in the lumber trade, as it is much the same in quality and appearance as longleaf pine.

THE LOBLOLLY PINE

The fourth of the yellow pines of the South is the loblolly or old field pine, whose lumber is saturated with pitch. The trees grow in marshy regions along the coast, and for the most part occupy land that is sterile and worthless. These tide water pine forests follow the swamps from New Jersey around to Texas. In early days this was the building pine of the South. The virgin forests are gone, and the new generation is inferior in quality, because the trees are not allowed to attain their full growth. Though rich in resin, there is little flow of turpentine from these trees, but the wood catches fire easily, and is one of the best of fuels.

We shall know this pine by its pale green, twisted leaves, always in bundles of three, six to ten inches long, enclosed at the base in sheaths that are not shed. The cones are three to five inches long, with ridged scales set with prickles. This tree bears a great crop of cones yearly, and its seeds are remarkable for their vitality. So are the seedlings, which grow on land so wet or so poor that few other trees compete with them. The first ten years in the life of a seedling pine is a period of tremendous growth. Fire rarely

sweeps these young forests, for the trees are well protected by the marshy character of the land in which they grow. Left for a century or two, these trees produce masts for the largest vessels, equal in quality to the finest in the world.

THE NORTHERN PITCH PINES

We have nothing in the Northeastern states that compares in importance with the pitch pine of Southern forests, but we have pitch pines which everybody knows. The first is the gnarled and picturesque pitch pine that grows on worthless land, and thrives in patches along the sea coast, where other evergreens are unsuccessful. The rough, rigid branches which spring from the short trunks of these trees carry a burden of blackening cones which give them a very untidy look when the trees are small. When they reach fifty or seventy-five feet in height, a certain nobility and picturesqueness of expression challenge our admiration, and the clusters of cones are not at all objectionable; indeed they heighten the tree's beauty.

The needle-like leaves of pitch pines are always in threes, rigid, stout, and three to five inches long, dark yellow-green, the bundles in black

sheaths that are never shed. The cones require two years to ripen. They are from one to three inches long, pointed, with sharp backward-pointed beaks. The wood of this tree is used for fuel, and locally for lumber, but it does not interest the lumbermen. The wood is not good enough, and the trees are too small and scattered. The tree does a good work by growing on worthless land, and near the sea coast. Its picturesqueness is becoming to be more appreciated by landscape gardeners who are bringing it into cultivation.

The handsomest of our pitch pines is the red pine, whose dark green leaves are six inches long, and cluster in twos upon the twigs. The bark, the wood, and the bud scales are all red. The cones are from one to three inches long, with thickened scales which have no spines. The tree grows into a broad pyramid, branched to the ground, with stout twigs, and luxuriant foliage. The symmetry and vigour of growth makes this red pine a handsomer tree than the ragged, discouraged-looking pitch pines. It is well for the landscape that its wood is very disappointing. So many beautiful groves are allowed to reach great age, and size, where white pines would have fallen to a lumberman's axe.

The home that has a beautiful red pine within

The spiny-leaved, red-berried holly is a handsome evergreen tree for the lawn

What would Christmas be without holly branches and wreaths for decoration!

sight of its windows, or a double row of these trees serving as a wind-break to ward off the storms of winter, is truly well planted. Without one or more of these trees, there is a decided lack. Any nurseryman can furnish handsome young red pines, so no one need hesitate to plant this native tree.

The Jersey pine is a twisted, low tree, with dark, discouraged-looking branches, covered with grey-green leaves that have a sickly yellowish tinge when the new shoots appear in spring. The leaves are always in twos, and they range from one to three inches long. The small cones are dark red, oval, with thickened scales spiny-tipped. These trees cover waste land where there is a meagre living for any tree. What wonder that they look stunted? Their chief merit is that they clothe the desert places, and furnish wood for fuel and fences, and thus save the great lumber pines for higher uses.

THE CEDARS, WHITE AND RED

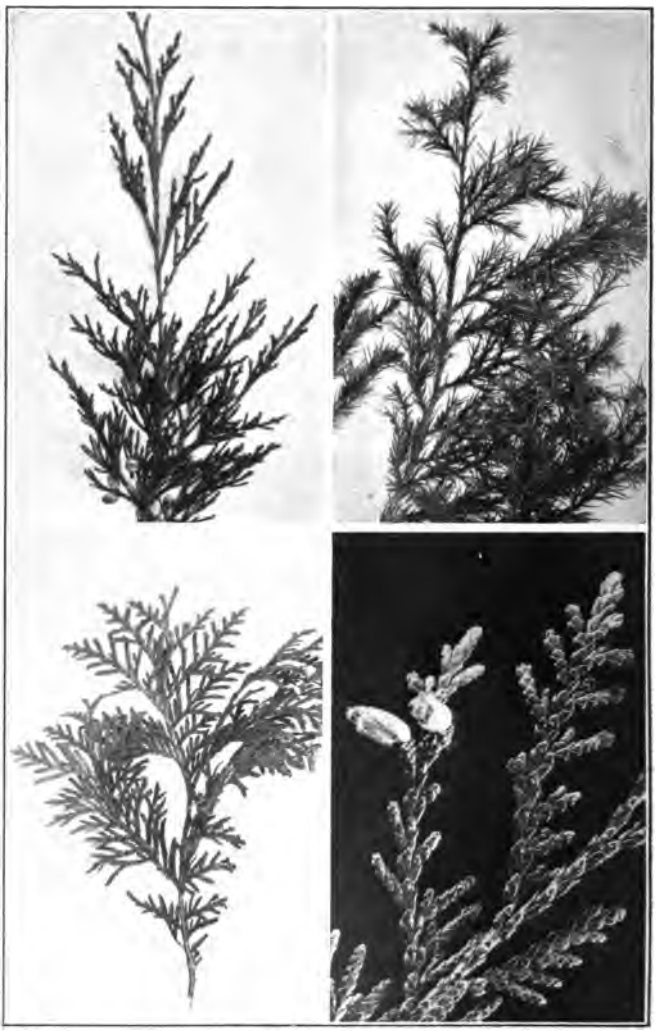
Beside the needle-leaved evergreens just described, there are some trees we all know, that bear cones, and are evergreens, but their leaves are strangly different from those of pines, spruces,

firs, and hemlocks. One of these is the familiar arbor vitæ, a conical tree, with flat leaf spray. Looking closely, one can make out the tiny, scale-like leaves, arranged in opposite pairs, clasping the wiry stems, and covering them completely. These stems are flat, so that one pair of leaves has a sharp keel on the middle. The next pair is spread out flat. The keeled pair covers the edge of the stem. The flat pair covers the broader surface. These pairs alternate through the length of the stem, and an aromatic resin seals them close.

The cones of the arbor vitæ are small, and they have few scales, compared with the cones of the needle-leaved evergreens. Each year a crop is borne, with two seeds under each scale. Few of us see the little red cone flowers in May, nor the pellets of yellow on other twigs, which are the pollen flowers. We watch the hedge clipper at work, trimming the thick green fronds that make a solid wall of green. Look carefully hereafter for the flowers and the ripe cones, in the proper season for each.

The white cedar grows, a fine, conical evergreen tree, in the coast states, from Maine to Mississippi. It loves best the deep swamps, but grows well in wet, sandy soil farther inland. Here we see again the flat spray of minute,

This big tree, "The Grizzly Giant," is over three hundred feet high. It is a sequoia, one of the cone-bearing evergreens



SCALY-LEAVED EVERGREENS

Upper: two branches from the same red cedar tree
Lower: flat sprays of arbor vitæ

pointed, and keeled leaves, but the cones are different. These are pale grey, and globular; the few scales are thick and horny, and curiously sculptured, each with a beak projecting from the centre.

The foliage mass is a peculiar blue-green, and the bark, thin, and rusty red, parts into strings and shreds.

Lumbermen call this tree a cedar. So they do the arbor vitæ. The wood of each is pale-coloured, and notable for its durability when exposed to weather and water. Fence posts of white cedar, and cedar pails, shingles, and the like, have a great reputation for durability.

The peculiarity of a red cedar is its fruit. Instead of a cone, a blue, juicy, sweet berry follows the blossoming of this tree. The foliage, too, is erratic. Minute leaves of the scale form, discovered in the other cedars, are found here on most twigs. They are still smaller, and the twigs are much smaller. But on new shoots, and often on a whole branch, the leaves are needle-like, one-half to three-quarters of an inch long, and spreading as the leaves of a spruce. The mass of the foliage is blue-green; these new ones are yellow-green. Among the branches hang these surprising berries!

The truth is that the scales of the cone thicken,

and become soft when ripe. They grow together, and the berry is, therefore, a cone, but much changed in its development from the cone on which the fruits of other evergreen trees are patterned.

We all know a red cedar tree by its tall, slim shape. The birds eat the berries, and scatter the seeds far and wide. The trees come up in irregular clumps in pastures and fence-rows, and in rough, uncultivated land. They are pretty widely distributed in the eastern half of the United States.

The true name for this tree is juniper. That is the name by which all its related species are known. Red cedar is the lumberman's name for its wood, and this name, though not right, will probably stick to it always.

Red cedar chests and closets are believed to be moth-proof. The aromatic resin in the wood is supposed to be distasteful to the insects which are the pests of housekeepers. To put furs and woollen blankets and clothing into these chests does not always prevent their being moth-eaten. This many people have learned by sorrowful experience. We know the fragrance of this wood in pencils. Thousands of trees are cut every year to supply pencil factories. With the scarcity of these trees, other woods are being substituted.

But who will be quite satisfied, or be persuaded that cedar pencils are not the best?

TWO CONIFERS NOT EVERGREEN

Two cone-bearing trees have the astonishing habit of letting go their leaves in the fall, and thus setting themselves apart from the evergreens, to which they are otherwise closely related. Their cones are like those of pines and spruces. Their leaves are needle-like, and their flowers are the cone flowers like the rest. Although they stand bare in winter time, their fruits declare their kinships with the evergreen. Their forms also suggest this kinship, for each is a spire-like shaft, from which short branches stand out horizontally like those of the pointed firs and spruces.

THE LARCHES

In the Northern states, and Canada, long stretches of cold marsh land are covered with solid growths of tamarack, our American larch tree. In summer the branches are covered with long, drooping twigs, each set with many blunt side spurs, from which a tuft of soft, needle-like

leaves forms a green rosette or pompom. The end twigs have needle leaves scattered their whole length, after the fashion of the spruces. Purplish cone flowers, and yellow staminate cones appear in spring, and in autumn among the leaves that are turning yellow a crop of cones is ripening. They stand erect and solitary on the twigs between the rosettes of leaves.

In winter the long, flexible twigs are bare except for these cones. The little knobs along the twigs are the stubs which bore leaves. In the spring new leaves come out, pale lettuce green, feathery, transforming the tree top into a thing of beauty.

This larch tree of ours is more sparsely branched than the larch of Europe. It looks ragged and unhappy when planted on our lawns. It is at its best in the cold North, where it grows in dense crowds, and the tall trunks are stripped free from limbs well towards the tops. These straight shafts are cut for telegraph poles, railroad ties, and posts. The heavy, resinous wood lasts a long time in the ground.

The larches planted for shade and ornament are of the European species, which thrives in any soil. It has a denser head of branches, and much more luxuriant crown of foliage than our native species. It is a beautiful feathery pyramid of green, dis-

tinctly different from other trees. In Europe large forests are grown on the mountain sides, and from these the tallest masts for vessels are obtained. The heavy, resinous wood does not easily take fire as do the pitch pines. The old wooden battle ships were faced with larch wood because of this, and because larch wood is so durable in contact with water. Indeed it has the reputation of outlasting oak, and the wood of all other conifers.

In the woods of the far Northwest, and inland to Montana, the Western larch is one of the mighty forest trees. Six feet in diameter, and 200 feet in height are not uncommon dimensions among these giant larches. These trees are of slow growth, and they stand with their roots in water or in wet soil, though on the mountain side. This is an important lumber tree with wood that has all the good qualities of its family. In Europe the tree is planted for forests, and as an ornamental tree. We cannot grow it in the Eastern United States. It is worth a journey across the continent to see it growing, one of the most magnificent trees in the world.

THE BALD CYPRESS

Travellers in the South pass forests of dark pines, and along the edges of swamps the pines often give way to solid stretches of trees with pale grey trunks, and lettuce green foliage, whose lightness contrasts strangely and beautifully with the solid bank of dark green that roofs the forests of pines. A closer look at these strange trees, which often stand knee-deep in water, is not so easy. At certain seasons of the year, however, these swamps are dry enough so that one may walk dry-shod among them, and so learn to know the bald cypress of the South, one of the most beautiful and interesting of native American trees.

This is the second of the cone-bearing trees which is not an evergreen. The leaves on the new shoots are two-ranked, soft and pale sage green in colour. The stems that bear these plumy leaves bear also scattered single blades. Among them are older twigs, tipped with cones, and bearing branchlets with scale-like leaves scarcely spreading at the tips. These are much smaller than the leaves arranged in two ranks, forming feather-like, leafy branchlets. It is these which are shed, branchlets, and all, in the autumn, and

fresh in spring renew the feathery grace of the long, narrow tree top.

The most surprising thing about the bald cypress is the flaring base of the trunk, and the root system which seems too large for the tall but usually narrow top. Knees of cypress rising out of the water from the main roots, are distinguished from stumps by their smooth, conical tops. The base of a great tree often spreads into wide flying buttresses, each hollowed on the inside, but serving with the others to support the hollow-trunked tree. Many a giant of great age stands thus on stilts whose submerged ends are the gnarled roots of the tree. From these rise many smooth, knobbed knees above the surface of the water in the rainy season. By some foresters, humps on the roots are supposed to be necessary to the proper breathing of the roots, submerged under water so large a part of the year. The question of what causes these growths, and of what use they are, is not fully determined.

The cones of the bald cypress are globular, and about the size of an olive. By them the tree declares its relationship to the needle-leaved evergreens. The wood is light and easy to work, but not noticeably resinous. It is used for buildings, and for special parts, such as doors, shingles. It is beautiful when stained, and would be more

valuable for interior finish of houses did it not keep the record of each bump and dent, as all soft woods do. Buckets and barrels to contain liquids are largely made of this wood. In railroad ties it proves very durable.

The best and strangest fact about this tree is that though it belongs to the South, and is a swamp tree by preference, it grows large and beautiful in the North, and in soil that is only moderately moist. The parks of Brooklyn have some noble specimens of this bald cypress of the South. They stand, tall, handsome shafts, feathered lightly with their short, drooping side branches, clothed with pale green leaves. There is no peculiarity of spreading trunk or knees to disturb the sod that comes up around the base of the tree. In the autumn the foliage turns yellow, and drops with the larch leaves. Through the winter the globular cones are present to prove this bald cypress a relative of the evergreens, which are its neighbours.

THE HOLLIES

No Christmas is Christmas truly without at least a few branches of the evergreen holly of the South, whose leathery, spiny-pointed leaves

are brightened by clusters of red berries. Every year, hundreds of crates and boxes of these holly branches are shipped north from the woods of Alabama, and other Southern states. Many people make their living by cutting loads of these branches, and hauling them to the shipping sheds, where they are packed and put onto the railroad. The business has grown so rapidly within the past twenty-five years that holly trees are becoming very scarce. It has never occurred to those who cut down and strip the trees that it takes years to grow new ones, and that nobody is planting for the future.

Holly wood is white, and very close-grained. It is admirable for tool handles, whipstocks, walking sticks, and for the blocks on which wood engravings are made. The living trees are planted for hedges, and for ornament. The leaves are evergreen, and the berries add brightness and warmth to the shrubbery border when snow covers the ground.

Although it reaches its greatest size, and is most commonly found in Southern woods, this little tree follows the coast as far north as Long Island. I have found it much higher than my head, growing wild on the sand bar that separates Great South Bay from the ocean, east of New York Harbour. Further north, it is occa-

sionally found, but in stunted sizes, easily winter-killed.

The holly of Europe, which has brig English Christmas for centuries, has a deeply cleft and spiny leaf than our it, our holly leaves and berries are dull, and dark-coloured. The whole tree lacks the brightness of the European species. Hedges of this lustrous-leaved holly shut in many an English garden, and their bright berries glow cheerfully through the grey, sunless, winter days. No wonder the gardeners frown upon the little thrushes that feed upon these berries, thus robbing the garden of one of its chief winter charms.

Three other American hollies are found as shrubby trees in our Eastern woods, but none of them is evergreen, and the trees are not numerous in any locality. We shall oftenest see the species known as the winterberry, whose abundant red berries remain untouched by the birds, until late in the spring. Many of these fruit-laden branches are gathered in the wild, and sold in cities for Christmas decorations. Sprays of these berries are often added to the evergreen holly branches when their own berries are scarce.

Christmas holly is something we cannot do without. As the supply grows less, the price will mount higher. Then will come a time when it

is profitable to raise these trees in quantities, and holly farming will be practised in favourable localities in the Southern states. But that time has not yet come.

THE BURNING BUSH

A little tree, not at all related to the holly, but truly a cousin of the bitter-sweet, has a rather surprising name. In summer it looks like a wild plum tree, except for its fluted, ash-grey bark. The flowers have purple petals, and look somewhat like potato blossoms. They would never attract your attention as you pass the tree.

In the autumn the leaves turn yellow, and gradually the purple husks that cover the scarlet berries split open, and curl back. Watch the gradual opening of these husks, and notice, from some little distance, the gradual reddening of the tree top, as the yellow leaves fall, and more and more of the scarlet berries are revealed, as the husks curl and shrink away from them. It is in this seed and its husk that the resemblance and relationship of the burning bush and the bitter-sweet vine is revealed.

The European spindle tree, and a number of Japanese and Chinese species, are now planted

in American gardens, and called by their genus name, Evonymus. The red-fruited sorts all come under the common name, burning bush, and they do burn with a steady flame when winter has robbed the gardens of colour. Evergreens form a beautiful background for these ruddy little trees.

TREE STUDIES IN THE SPRING

THE AWAKENING OF THE TREES

ALL winter the grey beech trunks look almost white among the dark trunks of neighbouring trees. Their branches are dark at the tips, and the buds are long, slim, and sharp-pointed. Silky, brown bud scales, in many layers, protect the young shoots hidden in these buds. In April these shoots impatiently push aside their wrappings. The outer scales fall, the inner ones grow longer, but the growing tip leaves them behind, and they fall, while the silky-coated, fan-plaited baby leaves hang limp and helpless on the lengthening stem.

No tree of the woods is more beautiful than the beech as its twigs cover themselves with the tender green of spring. Beech leaves are *handsome* when full grown. In the short hours of their babyhood they are *lovely*.

The sturdy shagbark hickory is late in waking. Poplars and beeches are in full leaf when the big buds of this familiar tree with the shaggy bark begin to swell, and show the pale, silky inner scales under the black outer pairs, which soon fall off.

The branches are stiff and angular, but the twigs hold up their big buds, and the trees look like great candelabra, each holding up a thousand lighted candles. As the pointed buds push upward, the protecting scales grow rapidly larger, and the outer ones turn back like the sepals of an iris. Wonderful tints of olive and yellow, violet and rose, blend in their silky covering. Out of this petal-like frill rises the cluster of young leaves, small but perfectly formed, and just as varied and delicate in colouring under their velvet covering. These complete the flower-like appearance of the young shoots. The illusion lasts only until the leaves spread out, and take on their natural colour and size. The scales fall, their duty done, and the flower catkins come out, under the broad umbrellas of the fresh, new leaves. The tree is thoroughly awake, and has begun its long summer's work.

The poplar likes to grow in moist ground, and in companies of its own kind. Copses of these trees, especially if they be young ones, are sure heralds of the coming spring. Their stems and branches are smooth, and almost as pale as white birches. They become greenish, especially the smaller branches and twigs, as the sap rises. They are alive from root tips to shining buds.

The brown scales loosen in March on the

The great winter buds of the shagbark hickory open like flowers in May

Pink and silvery catkins of trembling aspen, and the white, flannel-like leaves, just opened

plumpest buds. The fuzzy grey pussies push out, and lengthen into soft chenille fringes that wave gracefully from every twig. They are grey, with a flush of pink, an exquisite colour harmony, too lovely to last. Their catkins fall as soon as their golden pollen dust is ripened and scattered by the wind. The plain, green fertile ones on other trees catch the pollen, and set seed which ripens, in green, berry-like capsules, in May. The seeds are almost too small to be seen. Each floats away with the small wisp of down in which it hides.

The slim buds on the same twigs open while the trees are still in blossom. The young shoots come out, and unroll their baby leaves, soft and white, covered with a silky down, and tinted pink under the protective hairs. For a short time only they look like white velvet, and are limp and helpless. Then the hairy coat is shed; the leaves become shiny and bright green, and twinkle in the sunshine. The stems are flexible and long and flattened. This makes them catch the breeze, if the blades do not, so the foliage trembles whenever a breeze goes through the tree top.

Quaking aspen, trembling aspen, and "quaken-asp" are popular names given this tree, whose foliage has the appearance and the sound of rippling water. Tradition says the tree is for-

ever accursed, and trembles as from fear, because the traitor, Judas, hanged himself on an aspen. This is a foolish notion. Only gaiety is expressed by the continual fluttering of the aspen's leaves.

The buds of cottonwood and Balm of Gilead trees are sealed with a fragrant wax which softens as spring loosens the scales and growth begins.

Bees throng these trees, and gather the soft wax to carry to their hives. They use it to stop up cracks that would let in the rain. What is not needed at once they store for future use. Bee-keepers call it "propolis." They have offered the bees something "just as good," but they will take no substitute for the genuine. That is produced only on the buds of trees of the poplar family, and for a brief season it is ready for them in spring.

TREES THAT BLOOM IN EARLY SPRING

In late March, or early in April, before the leaves have come out on any of the trees along your street, you may look out of an upper window and notice that strange-looking tassels are hanging on the twigs of a poplar or cottonwood tree. Its buds are large and they shine in the sun, as if they were wet. A day or two later you

may be walking with your mother or sister, and she will be startled to see the sidewalk covered with what look to her like great red caterpillars! Then you may remember the tree with the tassels on it, and recognise them, and explain where they came from.

A single look shows that this worm-like object is a catkin, and the lovely red is the colour of the many stamens that contain the pollen dust. When this is ripe the stamens burst and let it fly away. Then the tree lets its catkins fall, for they have done their part.

Green catkins hang on other trees of the same kind in the neighbourhood. The flowers are waiting for pollen that will enable them to set seed. If the wind blows in the right direction when the pollen is flying about, the green, fertile flowers will get all they need. These catkins are not shed as the red ones are. They make little show among the opening leaves, but little seed balls take the place of the flowers. By the end of May the green balls the size of peas turn yellow, and open. Out of each pod floats tufts of white down, each bearing away a tiny white seed. This is the end of the story. Before the chestnut trees have begun to blossom, the poplars have scattered their seeds, and have all the summer to spend in growing long, supple shoots

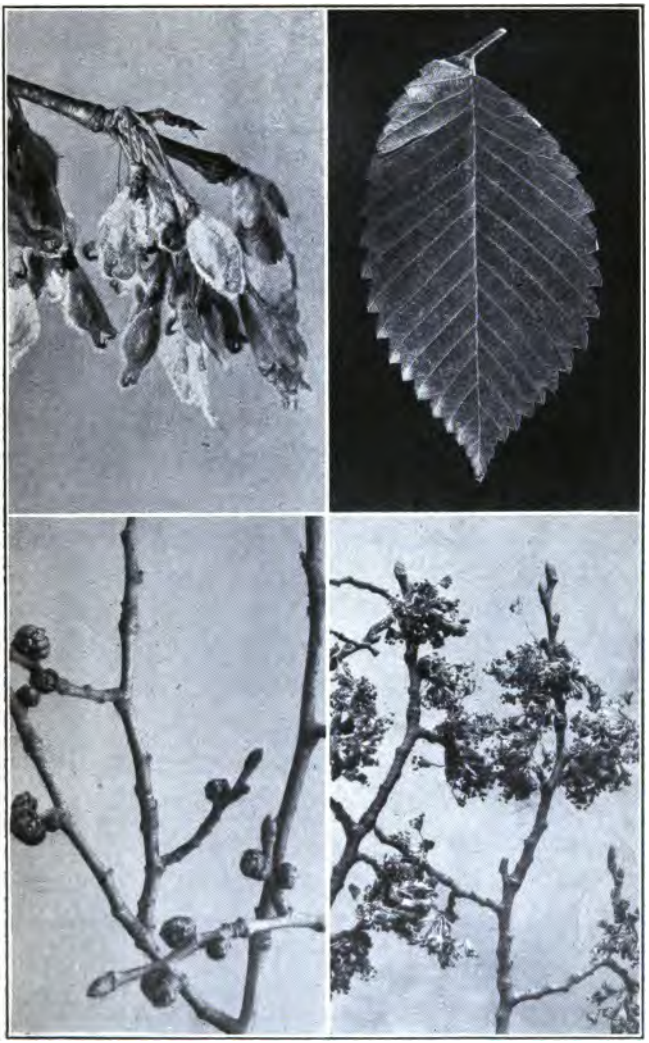
covered with their dancing, shining leaves. They look as if they enjoy life!

The pussy willows push their fuzzy noses out in winter. Some are even showing in autumn. But the yellow pollen is not seen on these flowers until the catkins are full grown, and they wait till winter is past. They dare not risk a frost.

Among pussy willow trees there is a difference in the catkins. On one tree they turn yellow when mature; the golden pollen dust rises in a cloud when the twig is disturbed. These catkins soon fall off.

On other trees the catkins are greenish, and they stay on after reaching full size. They are the fertile flowers, which develop into seed pods. Pollen brought to them by the wind or by visiting insects in search of nectar, insures the setting of seed in these flowers. Though the gayer flowers fall, they are quite as necessary to the making of seeds as the fertile ones. In all the willows and poplars, it requires two trees, bearing the two kind of flowers, to make the seed. And the wind and nectar-seeking insects are necessary as pollen-carriers.

In marshy land, or by a brook or river, or even just outside the window at home, there is a tree that turns rosy in March with a multitude of small red flowers clustered on the sides of



The winter flower buds, the blossoms, the full-grown winged seeds, and the ribbed leaf of our American elm

The majestic, fan-shaped elm blossoms while snow is still on the fields

its twigs. It is the swamp maple, the red maple, the river maple, the scarlet maple. Two of these names tell of the tree's thirst; two name its colour when in blossom, and also when the leaves change colour in autumn.

Each flower is a red bell, for the petals are red. One has a red forked pistil thrust out; another lacks a pistil, but has a cluster of yellow stamens. One tree may be deep red throughout, having only pistillate flowers. Another may have only staminate flowers; it will be orange coloured, by the blending of the colours of the yellow stamens, and the red petals. Another tree may have flowers of both kinds. Occasionally flowers will be found that have both stamens and pistils.

The bees are in the scarlet maples at the first loosening of the bud scales. There is nectar in those flower bells. The colour and a faint fragrance tell this secret. From pollen flowers the busy insects carry the golden dust to the forked pistils that set seeds.

The wind helps by scattering pollen in the tree tops, and very soon the flowers are gone. The staminate trees turn green when the opening leaves lose their vivid red. The pistillate trees hang out red clusters of winged seeds below the opening leaf clusters. These red trees keep

their name written plainly as long as the seed clusters swing.

Early in March, the side buds on the elm twigs begin to swell, and soon clusters of purplish flowers, small but very pretty, come out of the largest buds, and the tree top has a purplish haze upon it, that means that spring is coming. The bees come to get nectar from these early blossoms, but few people speak of the blossoming elms. They do not notice that elms ever blossom; and are rather incredulous when a spray is shown them covered with the graceful little tassels. "Who ever *heard* of elms having flowers?"

The truth is that every tree, when it is large enough, bears flowers. Not every one bears fruit, for some have pollen flowers only, the seeds being borne on the fertile trees. Elms have perfect flowers, and soon after the leaves open, the green fruits are seen in clusters, and before May passes, the seeds, each surrounded by an oval wing, flutter off in the wind.

THE AMERICAN ELM AND ITS KIN

Beautiful and stately, yet full of grace is the form of a big elm tree against the grey sky of a cloudy winter day. The tall trunk is

crowned with many main branches, which spread into a widening funnel shape, subdividing into numberless smaller branches, whose direction is outward and downward. The numerous twigs have the droop of a weeping willow. The tree top is wonderful when every limb is bare.

In summer the same tree is a great fountain of green leaves. The long, leafy twigs of new wood are flung out to the wind, and the twinkling blades dazzle the eyes like spray. This is the time that we love the elm for its shade, and as an ornament to home grounds and parks. Roadside elms are the favourite nesting trees of the Baltimore oriole, whose hanging pocket of grasses and yarns swings at the end of a high outer branch.

When winter is still in the air, and snow on the landscape, the dark twigs of these bare elm trees change colour. It is the purple flower clusters that are flung out from opening buds in late March. It takes sharp eyes to see the cause of the wine-coloured flush in the tree top. With the opening of the leafy shoots in April, the trees get an added colour from the pale green seed discs that replace the flowers. These are winged, and they soon turn brown, and fly away on the first breeze. This is the elm's way of sowing seeds. A crop of young elms grows each

summer in fields and gardens near these seed trees. The leaf of the seedling is exactly after the pattern of the parental tree, but smaller.

The English elm is less graceful than our American tree. It has more the stature of the white oak. The head is compact, and the foliage mass thicker, and longer-lived. The robin redbreast nests close to the sturdy trunk, shielded by the earliest leaves.

An old couplet guides the farmer in the old country:

> "When the elm leaf is as big as a mouse's ear,
> Then to sow barley never fear."

The toughness of elm is remembered by all who have "read of the wonderful one-hoss shay." Nothing but "ellum" was proper stuff for the hubs, you know. As it is durable in soil, elm is good timber for posts and railroad ties. By its toughness and flexibility, it is fit for waggon tongues, and all kinds of agricultural implements. The ancient warrior of England was likely to carry a longbow made of the tough British elm.

Slippery elms grow more irregular in form than the American, and are usually smaller trees. Both kinds grow together in the wooded regions east of the Rocky Mountains. The difference between them can be easily detected by a blind

person. Twigs, buds, and leaves of slipper elms are made rough and harsh to the touch by coarse, reddish hairs.

Boys and many other people like the taste of the glutinous inner bark of this tree when the sap is running, and the limbs and trunks peel easily. Many a tree is sacrificed to this appetite. The same delectable mucilaginous substance quenches the thirst and allays hunger,—so hunters say, who have eaten it when lost in the woods, and threatened with starvation. Poultices of it relieve throat troubles, when there is congestion. It is a home remedy for inflammations and fevers. Dried and ground, the rich cambium is mixed with milk, and forms a nutritious and tasty food for invalids. It is a staple on the shelves of apothecary shops.

The rock elm might be mistaken for a bur oak were the leaves not decided proof that it is an elm. The limbs are shaggy, and the twigs winged by the corky bark. Indeed, another name for the tree is the cork elm. The framework of this tree is stiff and irregular, a decided contrast to the graceful drooping top of the American elm, whose symmetry is one of its best points.

The wood has its fibres so interlaced that no wood excels it in toughness and springiness. It is the wheelwright's choice. It makes the

finest bridge timbers, and the best axe handles, and wheel hubs.

The winged elm is the smallest and daintiest of the elms. The twigs are broadened by a corky ridge on each side. This gives the tree its name. The Indian name, Wahoo, is also heard in the South. The leaves are of the elm type, but unusually small.

It is seen as a street and lawn tree in cities and towns south of Virginia, and west to Illinois and Texas.

THE MAPLE FAMILY

If you meet a tree of good size, with slender branches, and small buds set opposite upon the twigs, you may suspect it of being a maple. The leaves are needed to assure you. If it is winter time, and the tree stands on the street, the leaves may all have been raked away. If the tree grows in the woods, the chances are that there is a leaf carpet over its roots, and that most of these leaves have fallen from its branches. You can make sure of this point by picking up a dead leaf, examining the base of its stalk to see if it fits the leaf scars on the twigs. If the leaves are simple, that is, if they have a single blade, the evidence that this is a maple is very strong.

There are a few small trees with simple leaves set opposite on the twigs, but they do not grow as large as maples.

Does the leaf have three main divisions, each with a vein which is one of three large branches of the leaf stalk? Then you may be sure that the tree is one of the maple family.

Simple leaves, of three main lobes, set opposite on the twigs, and the twigs set opposite on the branches,—in these are the plain signature of the maples. They write their names in these characters, across every branch throughout the growing season, and on the leafless branches, and the dead leaves under the tree in winter. Another signature is the one-sided maple key, which hangs on the trees all summer, and even late into the winter on some kinds, but is shed in early summer by a few.

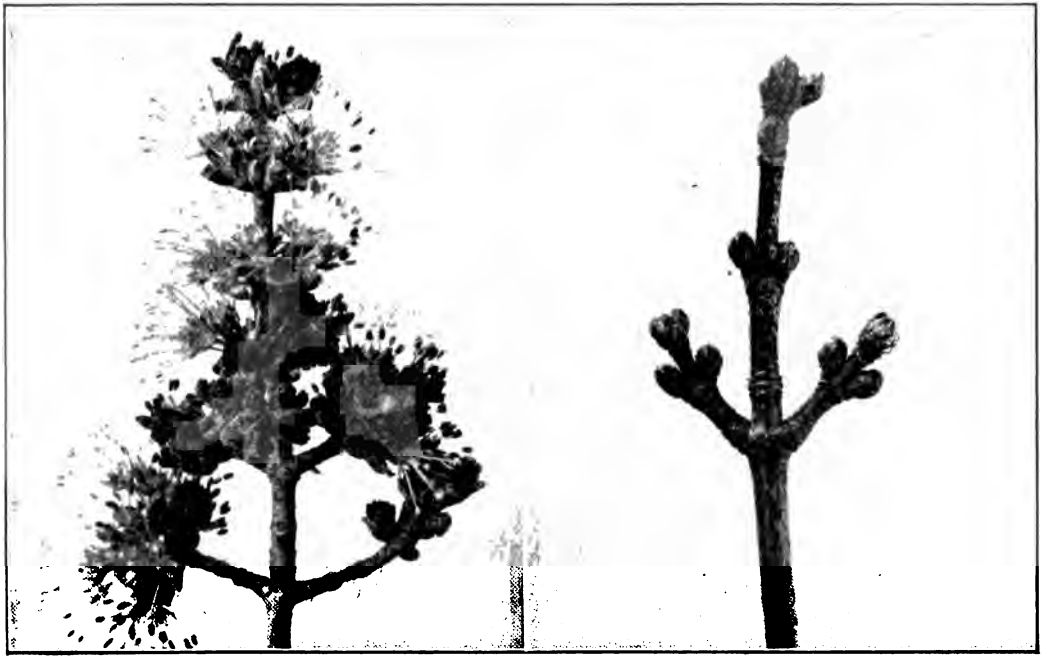
The two early-blooming maples are commonly planted as street and shade trees all over the Eastern half of the country. It is easy to recognise these, and to know them apart by the leaf alone.

The red maple is a spreading, symmetrical tree, of medium size with slender, erect branches. The leaves are red when they open in spring; so are the flowers which cluster on the bare twigs in early April, before the leaves are out. The

clustered fruits that dangle in pairs all along the stems in May are red, and in the autumn the tree changes its green robe of foliage to scarlet before winter comes. The buds that cluster at the joints are red as rubies, and the slim twigs glow with the same warm colour, which is warmer by contrast with the snow.

All maple leaves are more or less cleft into three main divisions. The red maple has two shallow clefts, V-shaped, at the top, and the lobes are pointed and triangular. The margins are irregularly saw-toothed. These leaves are often downy beneath, and always white-lined when young. In summer they have pale green linings. As a rule, red maple leaves are small, averaging less than three inches in the length of their blades. They are larger on young trees.

The silver maple is much more easily grown from seed than the red maple, but it has a far more irregular tree top. The limbs branch low on the trunk, and these limbs grow very long, giving the tree a loose head of great height, and great horizontal spread. The small branches curve downward, and the twigs are held erect. The wind twists and breaks these great weak limbs, or wrenches them loose from the trunk. It is dangerous to have these trees near the house, for wind and ice storms are constantly snapping off



The flowers of the red maple are concealed in winter in brown buds

Seeds of red maple, in late May, and in early April

branches large enough to break windows, or knock down chimneys as they fall.

The flowers of the silver maple show no red. They come out greenish-yellow on the twigs when the red maple's flowers are glowing on their red twigs in March, and early April. The leaves are pale green, white beneath, and set on long flexible stems. They are larger than the leaves of the red maple, and cleft in a distinctly different way. A narrow, deep fissure divides the leaf in thirds, and two side clefts divide the lower lobes in two unequal halves. These fissures reach two-thirds of the way through the leaf blade, and each lobe is cleft along its sides, into many irregular bays and capes. These leaves are always silvery white beneath in summer, and they turn to yellow in the autumn.

In late May the pairs of winged keys hang on short stems. Each key is about two inches long, fuzzy green, until ripe, twice the length of the smooth keys of the red maple, which are ripening at the same time.

It is good fun to lie under a maple tree, and watch the seeds as they fall. If the wind is strong, they shower down like rain. Each key separates from its mate, and as it lets go its hold on the twig, the wind catches its thin wing, and sends it whirling round and round. The

heavy seed makes for the earth, while the flat blade above it acts as a parachute, or a sail, to keep it in the air.

How far does a silver maple send its seeds in these summer days, when they are falling? It is easy to answer this question by pacing the distance from the tree trunk in a straight line to the point where the farthest key falls. Go in the direction towards which the wind is blowing, in determining this distance. It will be interesting to run out another line from the tree trunk to find out how far the seeds are thrown on the side that is against the wind.

From the silver maple go to a red maple, and watch the harvest of these small-winged keys. Do a little measuring here, and find out if their smaller size and weight enables these seeds to sail further in the same breeze than those of the silver maple.

The sugar maple is known also as the rock or hard maple, because its wood is harder, and therefore slower to grow, than the two quick-growing soft maples just described. This is the one whose trunk is tapped in spring, and the sap boiled down in great kettles over an open fire in the woods. When the water is all evaporated, solid cakes of maple sugar remain. If you are walking in the woods in winter, and come upon

any trees bored with small auger holes, several near the base of each trunk, you may suspect that this is a grove of hard maples which the New England farmer calls his "sugar bush."

Look at the twigs, and you will see that the plump round buds are set opposite, and the twigs are opposite on the branch. This is the way with all maple trees. Are the branches many, and do they shoot upward rather than outward, and form an oval head? This is the typical habit of young hard maple trees. As they grow older the heavy lower limbs become horizontal. They are clean, hardy, vigorous trees, long-lived, dependable, able to meet the storms, and to suffer the theft of their rich sap every spring without apparent loss of strength and vitality.

The leaves come out later than those of the soft maples. They are firm, and broad, with five pointed lobes between wide fissures that reach half-way to the stem. Margins of these lobes are wavy, never saw-toothed, like those of the silver maple. They are dark green above, with paler linings. In autumn they turn to yellow, orange, and red.

The flowers open in May, shortly after the leaves appear. They are in thick, hairy, yellowish clusters. Some are pistillate, some staminate, in the same cluster. Those with the forked

pistils remain and grow into smooth fruits towards the end of summer. The keys of sugar maples are short-winged, like those of the red maple, but have stouter, thicker seeds. They are shed in late autumn and early winter.

Hard maples are among the best of shade trees, and the glory of their autumn colouring makes them one of the most to be desired among trees planted merely for ornament. A street planted to hard maples is well planted always. But people are impatient for trees to grow up. The slow growth of the sugar maple is discouraging. It is a good plan to plant the quick-growing soft maples, and alternate with them the slow-growing species. For a few years the soft maples are pretty, and with each year's growth they give more abundant shade. By the time the wind has crippled their long arms, and made the trees unsightly, the hard maples are coming on to take their places, and they need the room which is given them by the removal of their neighbours on to the left and right.

When I went into the woods of Oregon, I found the vine maple trees, which seems not to have sufficient backbone to stand upright. These trees start to grow erect, but their weight soon overcomes their strength, and they droop, but keep on growing, with their limbs prostrate on the

ground. The wet land in many places was covered with a network of the interfering branches of these serpentine maple trees.

The leaf is about the size of the palm of my hand, and almost circular. The border is cut into many shallow lobes. The seeds are characteristic keys, smooth, and the wings of each pair are spread almost opposite each other.

The Norway maple is a most popular street tree. Its foliage is very dense, and the tree forms a round, symmetrical head. The broad, five-lobed leaves are remotely toothed, smooth, thin, and dark green on both sides. Break a leaf stem, and a milky juice appears. The seeds are very flat, and have broad, flaring wings. The flowers are yellowish. Great clusters of them come out with the leaves. The seeds are ripe in autumn.

We shall find that the foliage of the Norway maple stands the wear and tear better than that of many shade trees. The crown of a Norway maple turns to bright gold in autumn, and most of the leaves are still unmarred when they fall.

The box elder is the one native maple which has compound leaves. The leaf blade is cleft quite to the stem, and the thirds form separate leaflets, each mounted on its own stalk. These

leaves are set opposite on the twigs, like those of other maples.

In spring pink fringes like corn silk decorate the branches of certain box elder trees. Other trees of the same kind hide little green flowers among the opening leaves. The pink fringes are the pollen-bearing flowers, which fall when ripe. Staminate trees never bear fruit. All through the summer the trees which bore the greenish flower are dangling clusters of pale green seeds, each with the peculiar wing, which proves it a maple. When the ragged, yellowing foliage falls, these seed clusters remain on the branches, and all through the winter the wind is plucking and carrying them away.

The wood of box elder is very soft. The tree is planted because it grows so quickly and surely, and its seeds are so easily obtained. But broken branches give the older trees a crippled, unhappy look, and the ragged clusters of seeds give them a disheveled appearance all winter. Fortunate is the man who has planted elms or hard maples along the road, so that he may take out the decrepit box elders, and have the better trees coming on to take their places.

The striped maple is a little tree, which hides in the woods, and only a few people know the tree, and love it as it deserves. The stripes are

on its smooth green bark, which breaks into a network of furrows as the stems increase in diameter. These furrows expose a very pale under-bark, so that at a short distance the trunk seems to be delicately traced with white lines.

In its blossoming season the striped maple has a loose, drooping cluster of yellow, bell-like flowers. The leaves that surround them are broad and shallowly three-lobed, and saw-toothed all around. The seeds are little maple keys, smaller than those of the red maple.

The mountain maple is another little tree quite as modest and retiring as its striped cousin. It has longer, more taper-pointed leaves. The flower clusters are much smaller than those of the striped maple, and they stand erect. The fruits hang late in the winter, on the grey downy twigs, which are brightened by red buds.

THE WILLOW FAMILY

One of the first tree families whose name we learn is the willow family. The members are numerous, and the botanists find great difficulty in distinguishing certain species, which closely resemble each other; but these troubles we shall leave to the scientist. The point for

us to consider is this: When we see a tree which we know to be a willow, *how* do we know it? "It looks like a willow," some one says. But who knows, and can tell *how* willows look—how they differ from other trees?

First, willows have slender, flexible twigs that give the tree tops grace and lightness. Second, willow leaves are nearly always long and slim to match the supple twigs. They are always simple, and short-stemmed. The wood is light and soft, so the trees break easily in storms of wind and ice. An old willow tree is likely to be crippled, but its scars and wounds are covered in summer by the arching branches and the abundant foliage.

The first trees to blossom in spring are the shrubby pussy willows, a distinct kind whose catkins are so eager to push out of their scales that their grey, silky noses are often seen in November. Frequently, they are out and the scales dropped in February; but the yellow stamens and the long-tongued pistils do not rise above the grey fur until March, at least. The most attractive stage of these catkins is the earlier one, when the flower buds are concealed by the grey silk.

By cutting pussy willow twigs in the late fall, or any time during the winter, and putting them

into a jar of water, we may see the blossoming, quite out of season. Sufficient food is stored in the twig to force out the blossoms, even to the shedding of the pollen. It is a charming thing in the winter to have a vase of these twigs in full bloom on a window sill when snow banks are piled high just outside.

Willows are lovers of wet ground, and we shall see groves of them scattered along streams and on the margins of ponds and swamps. A few species thrive in dry soil, and seem to prefer it. Some grow at sea level, others are found on high mountains. From small shrubs they vary to mighty trees. There is no climate and no soil that does not have its native willows. The family is distributed from the Equator to the Arctic Circle.

It is very common in many places for farmers to plant a grove of willows for a windbreak, to protect their houses and barns. This is especially seen in prairie states and other treeless regions. Willows are quick-growing trees, and sure to grow. All one needs do is to cut limbs from a growing tree, chop these limbs into pieces the length of stove wood, and drive them into the ground. Each one takes root, and grows into a tree, if the soil is at all moist.

Another plan is to cut fence posts from the

willow grove, and drive them into the ground. Each of these posts forms the trunk of a willow tree, which soon has a great head of branches.

In Holland and other countries, willows are thickly planted to form hedges and for their roots to hold the soil along the banks of streams and ditches. The same trees may perform a double service. Willow wood makes good summer fuel, where a quick, hot fire is desired. The twigs make the best charcoal used in the manufacture of gunpowder. The long, flexible twigs of a low-growing willow are used in the manufacture of wicker chairs, tables, and other furniture. These trees are grown on a large scale in France and other European countries, and the industry is being introduced in some parts of America.

When spring comes on, we may notice a peculiar change in the colour of the bare willows that line the stream borders. The twigs turn gradually green, and the long, pointed buds prepare to cast off their single scales. These are shaped like the long, knitted caps which children wear in winter time, although there is no tassel at the end. The cap fits snugly over the long bud, and is fastened in a circle at the joint. The swelling bud simply pushes it off.

Under these trees, we shall find a good many

fresh twigs. Reaching up to break one, we find that it snaps off short at the base. It is not brittle along its whole length. Try a dozen twigs, and off they snap, almost at a touch. The wind has broken off those that fell to the ground. Some that fall in the water, float away down stream. They catch on sandbars, and strike root. Some swing in to the shore, and grow on the banks.

We have discovered a habit of certain kinds of willow trees. The shedding of their twigs at the season when they are fullest of life is the tree's method of colonising new territory. These twigs float away, and blow away, and those which lodge in wet ground before they dry are almost sure to grow. The billowy acres of green which cover sandbars and stream borders are willow trees, children of parents that grow far up stream.

Along roadsides in this country a large willow is much planted, whose leaves are pale beneath, so that they look very cheerful and cool in midsummer. The most striking thing about these willows is that their twigs are yellow as ducks' feet, and particularly bright in early spring. The older trees grow very stout, and great branches leave the trunk close to the ground. This is the golden osier willow, one form of the white wil-

low of Europe, which does not grow vigorously in this country.

The weeping willows, whose long, supple branches sweep out and downward, sometimes yards in length, from the tree top, came originally from Babylon. Who were they in that far country who "hung their harps on the willow trees"? A great many weeping willows in the Eastern states are said to be sprung from the parent tree, which grew on the Island of St. Helena. What famous prisoner probably sat under the shadows of this willow tree, and dreamed again of conquering the world? The weeping willow has the habit of snapping its twigs off, short, at the base. One of these long withes, cut into bits with one or two buds on each cutting, will start as many weeping willow trees, if the bits are stuck into wet sand and kept wet until rooted, and then set out and given plenty of water until they become established in the ground.

The black willow is named for the black bark of the old tree. It is the only one of the narrow-leaved willows whose leaves are uniformly green on both sides. These leaves are often curved like a sickle. At the base of each leaf is a pair of heart-shaped, leafy blades, called stipules. Many trees have stipules that come out with the

leaves, and are dropped off, but these persist, as a rule, all summer. The black willow is one of those with the twigs that snap. It takes possession of stream borders, and its offspring may cover miles of new territory in a single season.

The balsam willow we shall know by the fragrant coating of wax, or balsam, on its young shoots and buds. Its broad leaves are blunt at the tip, and look scarcely willow-like, but the tree is known by its buds and its catkins. To find it we shall have to go into the boggy regions in the Northern tier of states, where it is numerous, but never more than a shrubby tree.

One use is served by no tree as well as a willow. When the sap rises in spring, the willow branches are in prime condition to make whistles. I wonder if there is a boy, in town or country, who does not know how to make a willow whistle that will "go"? Surely not, unless his supply of uncles and grandfathers is short. You cannot make a willow whistle by following printed directions. Some skilful person, who has been a boy, must show you, and one lesson is enough.

WHY TREES NEED LEAVES

Spring or early summer is the best time to study the leaves of trees. They are clean, and

fresh, and new. Every tree is a great mound of green. The broad-leaved trees seem to be thatched or shingled with overlapping blades so that no sunlight can get into the darkened room, which is empty except for the bare branches that support this outer dome of leaves. A sugar maple, or a linden tree, shows best this outer thatch, which is so thick that the sun is unable to look through. The bird flying overhead sees only a solid mass of leaves. The one on its nest in a forked limb looks up and sees the inside of this leafy tree cover. She is glad for the twilight that surrounds her, and for the coolness of this shady place; but more glad that her nest is hidden from sight of hawks that sail overhead, while she keeps a close watch for sly, thieving red squirrels that may come to steal her eggs, by climbing up the branches.

What are the leaves for? Why does the tree put out in spring young shoots with rows of leaves along their sides? Why does the tree hold these branches out as far as possible from the trunk, and bend the leaf stems and the twigs so as to face the leaf blades towards the sun?

The reason is this: the life of the trees is in the green layer which we see on the surface of all green shoots, and which we can discover under the older bark of twigs, which has turned

brown. Following the twig back from its tip, all of the leafy part is green. Behind it the smooth twig is no longer green, but a thumb nail easily strips off the layer of brown, and reveals the green under bark. Go a little further back, and gradually the outer bark thickens, and it is more difficult to get at the soft under layer. After a while, we shall need a knife to reach it, for old bark is hard and tough.

When the bark gets so thick that the sun cannot reach the green layer, the colour fades out. The living part of the trunk of the tree is the soft, juicy layer between the bark and wood. Through this portion of the tree the sap rises from the roots, and finally reaches the leaves. This sap needs to be changed before it can be useful to the tree as food.

The leaves are the places where these changes take place. Through little doorways in the under sides of the leaf air passes in. With it goes carbonic acid gas, an important food element. The soft green leaf pulp, which is the green juice of a bruised leaf, has a wonderful work to do. It cannot do this work unless the sun is shining upon it. On a bright day every leaf is making starch, and sending it down through the twigs and branches as food. This starch is contained in the sugary sap that flows back constantly from

the leaves to the farthest root tips. It is made in the leaves out of the sap brought up from the roots and the carbonic acid gas which the leaves absorb from the air.

As long as the leaves do their work, the tree is able to grow, and to blossom, and to ripen its seeds. When the leaves have done their work the summer has passed; the tree lets go the leaves, and rests without growing all winter.

It is not easy to explain the work of the leaves, nor even to understand the wonderful work accomplished there all through the summer. When we eat, our food must go into the stomach to be changed by the processes called digestion. It is hours before the digested food is poured into the blood and carried to all parts of the body. The tree takes its food from the air, and from the soil. Neither the dirty water that rises as sap to the leaves, nor the gas which enters the leaf doorways from the air, is useful as food to the growing tree until they have been combined and changed. The leaves are, then, in a sense, the stomachs of the trees, for in them the raw foods must be "digested" before they are ready to be poured into the life blood that flows down through all the live parts of the tree. Now they are fit to feed the growing cells, which are always hungry.

LEAVES OF ALL SHAPES AND SIZES

The leaf of the tree is its visiting card. We shall learn to know trees by their leaves, as easily as if the name were written across the face of the leaf. Some leaves have a single blade of green, and for this reason the botanist calls them *simple* leaves. This blade has a stem that unites it with the twig. A *compound* leaf is one whose stem bears more than one blade. These small blades are called *leaflets*. There are two types of compound leaves, one feather-like, having a main stem with leaflets arranged in two rows on opposite sides of this stem. Such a leaf is feather-like. The other type has a leaf stem with all the leaflets attached at one end. The horse chestnut is the best example of this type. The leaves spread from the end of the stalk somewhat as the fingers rise from the palm of your hand.

The biggest leaves with single blades to be found in our forests grow on trees of the magnolia family. The silver-lined leaves of the large-leaved cucumber tree are over a foot in length, sometimes two and one-half feet, down South. These great leaves are about one-fourth as wide as long, and at the base each one broad-

ens and extends backward into two rounded ear-like lobes. This gives the tree the name, ear-leaved magnolia. The whole leaf flaps in the wind, like the ear of an elephant, and, of course, the wind lashes it into strings and soon robs it of its beauty.

The Northern cucumber tree is another magnolia whose leaves are tropical-looking. This is the hardiest of the magnolia family, and its heart-shaped leaves are six to ten inches long. They are not large for a magnolia of the South, but they look larger because they grow among the small-leaved trees of the Northern states.

The tulip tree has a large leaf of peculiar form. It is broad like a maple leaf at the base, but at the tip it is cut off square as if with a pair of shears, forming a right angle with its straight sides. Sometimes the leaf is notched, as if a V-shaped piece were cut out of the square tip. These leaves are long-stemmed, their blades polished, and they flutter on the twigs with the lightness of a poplar leaf. Once we have in mind the form of the leaf of the tulip tree, we shall never forget it, for it is different from all other leaves.

The catalpa tree, which lifts its great blossom clusters above the foliage in late June, is another of the few large-leaved trees of the North. The single blade is heart-shaped, six to eight inches

long, and more than half as broad. These leaves usually have plain margins, but sometimes they are wavy and notched near the base so as to produce faint side lobes. The blades hang on long, stout stems.

Among the feather-leaved trees, the walnuts and butternuts, the sumachs, and the ailanthus, furnish examples. A black walnut leaf is often two feet long, with a dozen or more leaflets on the longest ones. These leaflets are always set opposite in pairs, with an odd one on the tip of the leaf stem. Butternut leaves have the same form, but the leaves are longer. They range from fifteen to thirty inches, and have from ten to twenty leaflets, but always an odd number. The peculiar gummy feeling of these hairy leaves, and their pungent butternut odour when bruised, make it easy to know the tree wherever we meet it, through the long summer.

The hickories are cousins of the walnuts, but their leaves, though of the feather form, have larger and fewer leaflets than any walnut tree. A shagbark hickory leaf has one or two pairs of little leaflets on the stem, and above them three of larger size. The pignut has the same habit of clustering its three largest leaves at the tip of the leaf stem, and tapering off at the base with one or two pairs of decreasing size.

The largest of all the compound leaves have branched stems to which leaflets are attached. The main leaf stem's side branches may yet branch again, forming a twice-branched framework that is set with leaflets, not large, but so numerous as to make the whole leaf surprisingly large. The greatest of these twice-compound leaves is borne by that astonishing, spiny-stemmed Hercules' club. A single leaf is often four feet long, and nearly a yard wide. There are no leaflets on the main stem; they are on the side branches.

How shall we tell a leaf stem from a twig? Leaf stems do not look like the twigs of the tree. A little practice in looking closely and comparing these leaf stems and twigs will obviate any confusion of the two. The leaf has a bud at its base, and it breaks off easily at this joint.

Among the fine, feathery leaves that are so beautiful and light that they give great beauty to the tree tops are those of the honey locust. These leaves are of the feather type, the slender stems, with double rows of tiny leaflets. Very often we find among the single feather forms, leaves of greater size, which have branched stems. This branching multiplies the number of leaflets, and gives us, on the same trees, what the bota-

The sugar maple trees are tapped in February; they bloom in May after the leaves come out; they ripen their keys in October, when the foliage turns to red and yellow.

Leaves of black willow have frills at their bases. Twigs of pussy-willows, cut and brought indoors, can be forced into bloom in midwinter

nists call *once compound,* and *twice compound* leaves. The simple feather and the branched feather forms add greatly to the beauty and luxuriance of the foliage of the honey locust.

The common black locust of the roadside has single leaf stems with oblong leaflets set in opposite rows upon it. Ash trees have the same feather type of leaves, the leaflets usually pointed and oval, and always an odd one at the tip. They are all larger than leaves of the locusts.

In the maple family there is a broad, simple blade, about as wide as it is long. It is a family trait to have three main veins running out from the end of the leaf stem, into the blade. Each of these veins has side branches, and they are connected with a network of smaller veins. Between the tips of these three main veins the leaf is usually notched, so as to divide it into thirds. In the red maple these notches are shallow V's cut out, leaving triangular points. In the silver maple the leaves are cut by deeper clefts, which reach more than half-way to the leaf stalk. The three lobes are cut with jagged points into an uneven margin. The sugar maple has its three lobes separated by wide, deep clefts, and its margins are irregularly wavy. The box elder, which is a maple, is cleft so deeply that the blade is split into three distinct leaflets, each with its own

short stem. This makes a compound leaf of it. It is the only maple with a leaf of more than one blade.

The tree which shows the greatest difference in the form of its leaves is the sassafras, whose oval leaves grow on the same stem with mittens and double mittens—a mitten pattern with a thumb on each side. The hawthorns have small oval leaves with variously cleft borders. There are over a hundred kinds of hawthorns in our woods, and each kind has a leaf different from all the rest; yet a single tree will often show leaves that differ so much from the others in form that we might easily suspect, if some one brought them to us, that each grew on a different tree from all the rest.

Many oak trees have the same habit of leaf variation, so that even a forester has to examine many leaves with care, and with them the buds and the acorns, to make sure that he has called the oak by its right name.

The behaviour of the leaves of a tree depends largely on the length and flexibility of their stems. If they are long, and slender, and supple, the tree-top is in a continual flutter when the wind blows. If they are thick and stiff, they do not catch the breeze as readily, and their blades lie comparatively still when other trees near by may

be twinkling and trembling. Leaves with deeply cut borders, like some oaks and maples, flutter much more than leaves like the basswood, whose borders are unbroken. Oak leaves that are deeply cut will rarely lie down flat. The curving bays in its borders cause the leaf to curl, so that no matter what face is presented, the wind gets under and strikes some surface, and sets the leaf to dancing.

The flat leaf stems of the trembling aspen, one of the poplar family, are very flexible, and they are flattened at right angles to the blades of the leaves. When a breeze comes by, it may strike the edge of the leaf, but if so, it catches the flat leaf stem broadside. If it comes from any other direction the leaf trembles, because one of the blades is sure to receive the force of the wind. So the tree top is in one constant tremor, even when the breeze is scarcely sufficient to disturb broad-leaved trees which are near neighbours of the aspens.

Whatever the form and size and shape of its leaf, the tree depends upon its foliage mass for all the life it enjoys, and for all the growth it makes. The soil and the air feed the tree. The leaves and the sun do the work of digesting the food. In the porous wood and bark are the channels through which sap mounts upward to

the leaves, and another set of channels which carry the prepared food back, leaving it wherever needed, along the way from tip of twig to tip of root. Whatever is not needed is stored away, to be dissolved as needed and carried to the points where the need is. In spring it is the growing buds that chiefly need this stored food. Its presence explains the miracle of the bursting of blossoms and leaves when spring comes.

One by one the trees of your own yard may be learned by name this summer. The leaves are your sure guide. Trees stay where they are. Once we recognise their leaves and call them by name, we may depend upon finding them still standing the next day we pass them, and their leaves are still held out as the sign of recognition. Every time we pass yonder red maple let us glance at its three-pointed leaf, and fix its shape indelibly in the mind. When we have done this a dozen times, I am sure that we shall be able to pick out all the red maples in town; and if we journey far from home we may find and recognise the same kind of trees by the same sign. More and more as we grow older, we find out that half the pleasure of travelling is the occasional meeting with old friends, be they people or trees.

TREE STUDIES IN THE SUMMER

TREES WITH THE LARGEST FLOWERS

IF WE set out to find the trees that have the largest flowers, meaning to count only trees that grow wild in our woods, it will save time to go straight south into North Carolina, and climb the foot hills of the Allegheny Mountains. Or it may be that in the fertile valleys that lie between the low ridges we shall first come upon a magnolia, called the large-leaved cucumber tree. Anywhere from North Carolina to Florida, and west to Arkansas, these remarkable trees are likely to be found, in small groups. In cultivation, they are successfully planted as far north as Boston.

Before the tree has attained more than a man's height it is a wonder, on account of the leaves which measure more than a foot in length, and have their long, green blades lined with white. In June the flowers open—great white bowls, made of waxen petals, in a double row, the inner ones painted purple at their bases, giving the flower a purple centre.

The wind blows the leaves about, and tears them into rags, unless the tree is in a sheltered

place. The silvery leaf linings, as white as the blossoms, make it difficult to see that the tree is in bloom, until one is close enough to see the petals. If the leaves were green on both sides the great blossoms, as large as a man's head, would be seen afar off. The tree would look like a giant rose bush.

From Pennsylvania southward to the Gulf of Mexico, and west to Arkansas and Texas, the evergreen magnolia grows on stream borders, and even on uplands where the soil is not very moist. When this pyramid of shining green leaves lights all its waxen tapers, it is a sight worth a day's journey to see. Each stiff twig is bent upward, and there a bud appears in spring. A few at a time, the flowers open, and the blooming time lasts till August.

Each blossom is a deep, creamy cup, made of six wax-like petals, surrounded by three white sepals. Inside are many stamens, purple at the base, and a cone of pistils, all grown together.

The leaves are oblong or oval, often eight inches long, thick, deep green, and bright as if polished on the upper surface. The lining is dull green, sometimes covered with rusty down. The paler green and the brighter polish on the young leaves add much beauty to the tree in summer. In winter the leaves get grimy and

the tree top is sombre, for most of the foliage has seen much wear and tear.

In autumn the ends of the twigs hold up green cones, made of many furry capsules that end in curved horns. Each capsule splits when ripe, and a scarlet seed, like a berry, hangs out on an elastic thread, and swings lower and lower, until finally it is carried away. Thus the magnolia sows its seeds in winter.

The shining leaves of this magnolia come North at the Christmas season, and are used to decorate homes and churches. Holly, mistletoe, palm leaves, and the beautiful Southern smilax are other Christmas greens now commonly in use. They are all gathered with magnolia and shoots of the long-leaf pine, in the woods down South.

The swamp bay is a magnolia that grows as a shrub to New England, keeping to the swampy lands that skirt the Atlantic coast. Every spring the fragrant, creamy blossoms are to be bought from street Arabs in New York and Philadelphia. A single globular flower is surrounded by a whorl of oval leaves, bright green, but lined with a white, powdery substance that makes them look silver-lined. The flowers are deliciously fragrant, and most beautiful when not spread wide open. The seller often takes the trouble to spring the petals back, to make the blossom seem

bigger. The waxy petals turn brown soon after such handling, and all their natural beauty departs.

From Florida westward to Texas this magnolia becomes a slender, tall evergreen tree. The best flowers of this tree are borne on shoots that are produced by pruning back the new growth each year. The largest leaves and flowers are also the handsomest.

The cucumber tree is the magnolia of the North. It is a fine tree in Ontario, Canada, and from this region it spreads south, its range widening like a fan, reaching from Arkansas to the Carolinas, and Mississippi, and Alabama. The tropical appearance of the tree is due to the big, heart-shaped leaves. Their tulip-like flowers are as large as garden tulips, but they make scarcely any show, because they are very much the same in colour as the yellowish-green new leaves that surround them.

The "cucumbers" are the green cones that contain the seeds. They are very lumpy and irregular in form, but when ripe the cells split open and the scarlet seed, let down on an elastic thread from each, looks like any magnolia seed.

Cucumber wood is soft, yellowish-brown, and close-grained. It is not very good lumber, though put to many uses. The tree is worth

more alive than dead. It is an admirable shade tree, though not planted as much as it deserves.

The tulip tree is a close relative of the magnolias. It is one of the trees with large flowers, though, like the cucumber tree, the colour of the flowers makes them rather inconspicuous. In June the upturned twigs blossom with yellow tulips. The three sepals flare outward, the petals form the cup. A band of orange decorates the cup, and signals the bees which come for nectar hidden near the bottom of the flower cup, among the bases of the many stamens.

Many people see the gay petals of the tulip tree flowers when they fall on the sidewalk, and some wonder what these bits of colour are. A few will say: "There must be a tulip tree near by," and look up to find the singular squared-leaf blades that belong to no other tree. There is a whole tree top fluttering with them, and this tremulous motion explains why the tree is often called the tulip poplar. The yellow wood gives the name, yellow poplar. Pulp of this wood is used for the manufacture of the ordinary postal cards. It has many other uses, and is a valuable lumber tree. For shade and ornament it is one of the best trees to plant.

The cones of the tulip tree do not set free their seeds, as those of the magnolias do. Instead of

horned capsules, the cone has flat, overlapping blades, like the wing of a maple seed, and the small, closed seed case is the base of the blade. A few of these seeds are fully developed. But when the winter strips the tree of its leaves, the wind shakes the cones, and the loosened scales gradually fall. The wind catches the flat wings, and away they sail. Little tulip trees grow up where good seeds fall in favourable ground.

One day a neighbour told me that there was a tree in blossom on the side of the ravine. This was a strange story, for it was the dead of winter. We went to see this wonderful tree. What do you think it was? A tulip tree, with the seed cones half stripped of their seeds, and shining like yellow flowers on the ends of the twigs. It was not strange at all that a person who did not know the tree, and had never seen its cones in mid-winter, should make this very mistake.

The flowering dogwood invites us every spring to break off branches covered with big, white blossoms, each like a four-pointed star, with a cluster of small white buds in the centre. The trees are small and low-branching, their limbs are flat, and they spread outward and slightly downward. Who can resist cutting a few of the blossoming boughs of this lovely tree! The best part is that the tree suffers not at all if

the pruning is done with some care. Take a thought for the tree; cut the branches clean with a knife. Take them off where they are thick, and you will leave the tree better in shape than when you came. Do not strip it of flowers. This will cripple it. A few sprays of dogwood, prettily arranged in a vase, are a delight to the eye. A crowded mass of them is not at all.

The four outer wings of white are not the petals of a dogwood blossom. They are colourless leaves, the full-grown scales of the winter flower buds. The notch at the tip is made by the falling off of the withered tip which in winter protected the flowers. The base grew long and broad and turned gradually white. The bees see these white banners farther, perhaps, than they can catch the faint perfume. Watch the bee as she probes the middle flowers for nectar. See the pollen on her hairy body. From one to another, she is the pollen distributor of these flowers, and she doesn't know it.

TREES MOST SHOWY IN BLOOM

Sometimes a tree with very small flowers has such a multitude of them that it attracts more attention and admiration when in blossom than the

trees with the largest flowers. A magnolia blossom as large as a cabbage head must sacrifice delicacy to size. We must see it at a distance to overlook its coarseness, and to escape its overpowering perfume.

An orchard in early May is transformed into fairyland by the opening of millions of buds. Apple trees have just begun to unfold the new leaves. They are pale green, and coated with white hairs, so that a silvery cloud rests on the tree when the white blossoms, warmed with a tinge of pink, come with a rush that takes one's breath away.

A single apple blossom has its five flaring petals inside of five green sepals that are the bud's green overcoat. The stamens are many; the pistils five in the centre of the flower. The plan of the flower is five. The green lump below the blossom is the apple, already forming. Inside it are the five cells of the core, and each has its seeds already forming, if the five pistils have each caught a grain of pollen for each of the embryo seeds its chamber of the core contained.

The delicate colour and rich fragrance of the apple orchard are enchanting. To the honey bees these two signals call to a feast of nectar. All unknown to them, they carry pollen on their furry bodies from flower to flower, and thus

enable the pistils to set seed. If the days are damp and there are frequent showers while the apple trees are in bloom, the bees are kept at home, and there will be but a small crop of apples. Fortunately for the bees and for us, the blossoms do not all come out on the same day. The trees and the bees are hopeful till the last moment that the sun will shine, and the nectar be gathered, before the opportunity of the year passes.

Flowers much like apple blossoms in form cover the twigs of hawthorn trees. They are usually in many-flowered clusters, set off by the green leaves. Fragrance, sometimes sickening sweet, draws the bees and other insects to these trees. Nectar drips from the blossoms of some species. The thorny branches spread sidewise, holding the blossoms out in wide platforms. The red fruits, called haws, adorn the trees in late summer.

Plum and cherry trees are laden with white bloom, and heavy with fragrance. Some species haven't a leaf when they bloom. And these are among the showiest of blossoming trees. In these flowers there are single pistils, and but a single grain of pollen is needed to set seed. The single seed is the pit, or stone, of this family known as the trees with stone fruits.

TREES THAT BLOOM IN MIDSUMMER

In spring the big chestnut tree is late in putting out its leaves. It is May before the bare limbs are clothed with green. This crown is made of long, pointed leaves, each short-stemmed, strongly ribbed, with parallel veins on each side of the midrib, polished and sharp-toothed along its margin. It is a superb dome of unusually handsome leaves.

When the flower procession is long past and the grain fields have turned yellow, and the mower and reaper are humming busily, the chestnut's crown turns from green to gold, as if to harmonise with the landscape of midsummer. Each twig ends in a feathery yellow plume, which waves in the breezes, and sheds its yellow pollen abroad. The fertile flowers are at the base of the plume. As the yellow pollen flowers fade, the green scaly ones below them are swelling. They are the young chestnuts. The long tongue each held out to catch pollen when it was ready for use. Each flower has three nuts as its full quota to form. Failure to be pollenated may cause one of the three to fail. The husk will then contain two nuts.

In May the yellow locust trees still stand along

Leaves and flowers of the ear-leaved cucumber tree are the largest in the magnolia family

The orange-yellow flower cups and squared leaves of the tulip tree

the roadsides, or herded together along the banks of streams, bare and ugly, while the trees around them are beautifully clothed in their green garments, and adorned with blossoms. The dead pods still cling to the locust's branches, and not even the buds are in sight to prove the twigs alive.

Suddenly the trees wake, push out their hidden buds into shoots which unfold leaves made of tiny leaflets. The leafy spray is light and graceful, pale green with a silvery sheen at first. Soon the leaves are inundated with a flood of white blossoms, fragrant with their nectar, which hang in clusters from each twig. The bees see the white cloud on the locust tree, and hurry to the feast. Each curious pea-like flower has a honey pot in its horned petal. Throughout the summer the locust trees wave their fern-like leaves, among which the young pods swing, rosy and green, and velvety soft. The two thorns at the base of each leaf are there, but they are not conspicuous, unless you grasp a limb; then they let you know where they are, and what they can do.

On a summer evening we shall see that the locust has closed its leaves, folding the opposite leaflets together, and the whole leaf drooping from its stem. It reminds us of the old-fashioned sensitive plant whose leaves resembled these, folded its leaflets and drooped whenever it was

touched. Indeed, the locust tree and these plants are near relatives. The locust leaves are sensitive to the evening air. They close if a rain comes up, but open when the sun comes out again and the sky clears.

Locust trees have an insect enemy which bores into the solid wood, and ruins it for lumber. Even the twigs are swollen and distorted by these insects, which feed upon the rich sap that should go to feed the tree. It is impossible to reach this enemy with poison, so the trees are helpless.

Except for this unfortunate fact, locusts would be a profitable crop to raise for timber. Locust wood is very hard, durable, and strong. It is slow to decay when in water, so it is valuable for fence posts, and for boat building. It is used for hubs and spokes of waggon wheels, and it is an excellent fuel. The locust timber that reaches market comes from the mountain slopes, where the locust-borer is thus far unknown. The range of the tree is all over the Eastern states and west to the Rocky Mountains. We shall not find them south of the latitude of Tennessee.

The catalpa's great heart-shaped leaves, as broad as a man's hat, come out in May, but the leafy shoots grow a foot or more in length, and it is well along toward Independence Day before the flower buds show streaks of white above the

Flowers, fruit, and the three different leaf patterns of the sassafras tree

Waxy flower of the evergreen magnolia, usually eight inches across when open

foliage mass. The upturned twigs end in a spike of blossoms, creamy in colour, but speckled within their wide throats with purple and yellow. The rim of the flower cup is daintily scalloped, and frilled, and the tree top is even more showy than the horse chestnut a month earlier.

There is stateliness, even stiffness, in the figure of a blossoming horse chestnut—a pyramid of green holding up a thousand pyramids of white. The catalpa has a round head, and the loose flower clusters are quite informal in their arrangement. The flowers nod gracefully on their stems—a thing the horse chestnut flowers are unable to do.

Why are the dots of colour sprinkled in the throat of the flower? Why are they arranged in lines that lead to the nectar sac? To guide the bees which come in swarms in answer to the signals of colour and fragrance the flowers fling out as lures to them.

The two stamens are ripe before the pistil. The bee rubs the pollen off by crowding into the flower. Some of this dust is bound to be rubbed off on the ripe stigma of an older blossom visited by this bee. Thus, unconsciously the bee helps the tree to set good seed. Of these we will study when we come to the tree again in autumn. Only a hint of the seed vessel is given by looking at

the oldest flower in a cluster, and noticing the green part at the base.

The linden or basswood holds its arms out so that the broad leaves are exposed to the sun in slanting strata, or platforms of shade, that strike downward. The tree's frame is roofed in with them in an almost unbroken thatch of green. Cattle love to crop this foliage, and to enjoy the dense shade on a hot day.

In July the dark green is illuminated by thousands of starry white blossoms, a few at the end of a slender stem that rises out of a pale green, leaf-like blade. There is nothing like it borne on any other tree.

The news that the basswoods are in bloom reaches the hives in good time. One is able to hear the murmur of bees as far as he can see the flowers, but the fragrance travels much farther. Basswood honey is higher in price than other kinds. Is this the reason the bees are so hard at work? Small as the individual flowers are, they have an unusual supply of nectar, and the bees revel in the plenty of what will feed them and yield wax. They make honey while the sun shines, counting the basswoods their best source of the crude materials for honeymaking. It was so in the days of old. Greek poets sang of the honey-laden lindens. Honey made from

linden trees in the Lithuanian forests was carried to Rome, where it sold for three times the price of ordinary honey.

Bees swarm, and the new colony often takes to the woods and sets up housekeeping in a hollow tree. This is so likely in the Southern states to be a linden that " bee tree " is a familiar name of this tree.

THE EARLY BERRIES IN THE WOODS

Robins come to our cherry trees in June, and they hunt for our strawberries under the green leaves. The blackberrries come on, and the raspberries, and currants. The birds look at them with calculating eyes. An appetite for berries is inherited in them, learned in the woods, where wild berries have grown, and ripened for them, from the times long before there were gardens and cultivated fruits.

Back in the woods we shall find wild berries ripening, and birds feasting thankfully upon them. The harvest begins with the June-berries in the month of June. Serviceberries they are also called, and the tree is known also as the shadbush. We remember the lovely veil of white blossoms this tree put on before its leaves came

out. In June we might not know the trees, except that they bear red berries, few on a cluster, and here the birds are feasting.

There is no other tree with berries that ripen so early, unless it be the broad-leaved mulberry. Here, too, the birds will be found in numbers. Turn back the wide, heart-shaped leaves, and you will find the single berries of all sizes, some green, some reddening and soft. They are like blackberries, each made of many tiny berries, grown together.

The beauty of the mulberry is that its fruit keeps coming on from June until August. It is a very slow, easy-going tree, in no hurry to have its harvest over. The birds like the soft, seedy berries, which to our taste are insipid.

It is a shrewd thing to plant mulberry trees on the edges of fruit gardens, and set a row of June-berry trees along the road outside the cherry orchard. It is the scarcity of wild berries that brings the birds into our gardens. Many a fruit-grower has saved his crop by planting wild berry trees for the birds.

The elders are shrubby trees with large, fern-like leaves. They lift up flat, white flower clusters, sometimes as large as dinner plates, in June, and in the middle of summer dark red berries are ripening where the flowers were. Here is an-

other feast for the birds, and elderberry pies are the reward of boys and girls who gather the berries, and take them home to mother. Grandma thinks of elderberry wine, so good for many ailments, and if the berries are plenty it is easy to gather a bucketful to make a few pints of this old-fashioned cordial.

Among the shining green leaves of the wild red cherry tree the little fruits glow like rubies in the summer. Here is a feast for the birds. We find these small pin cherries very thin-fleshed, and sour, and the biggest of them is no larger than a pea. But how the birds love them! The bird cherry is indeed the bird's tree. In blossom it belongs to the bees, which come in swarms for nectar. To them, unconscious carriers of pollen from flower to flower, the birds owe a debt of gratitude. They insure the setting of seed, and this means a big crop of fruit.

The wild black cherry is later with its shining clusters of dark red cherries. They come in September, when the birds' procession has turned southward. The earliest comers hold high carnival in these trees, devour quantities of the bitter-sweet fruit, and drop the seeds near and far. The wind can do little in scattering the seeds of fruit trees. The birds are the chief agents of distribution.

THE SASSAFRAS

The sassafras is not important as a forest tree, yet I do not know another to whom so many kinds of people, of all ages, go, asking for favours this tree alone can give. Even in regions where the tree does not grow, its name is well known. Sassafras tea has a world-wide reputation as a cure for "spring fever," otherwise known as "that tired feeling." Drug store windows are piled high in spring with bits of the corky bark of the sassafras roots, and the buds in winter taste of the same aromatic oil, whose flavour rises from a steaming pot of sassafras tea. Many a bad-tasting medicine is made more palatable by a drop or two of oil of sassafras.

The leaves and twigs of young sassafras trees are used in the South to flavour and thicken gumbo soups. The wood of sassafras is light and tough. The long limbs are cut and stripped by country boys going fishing, who know what trees yield the best fishing rods. Sassafras posts last a long while, for the wood does not rot in contact with soil, or soaked with water. It makes good boats and barrels for this same reason.

Children know the sassafras tree. In winter they nibble the dainty green buds, or dig away the snow at the roots to get a morsel of the aromatic bark. In summer it is the leaves that are the chief charm of the tree. It is a fascinating game to look for the "mittens and double mittens," which seem to be more numerous than the plain oval leaves on this tree. There is no other tree that has three distinct leaf shapes. The mitten form has its thumb just right, on one side. It might be used for a mitten pattern. There are lefts and rights, and mittens of all sizes. The doll-sized ones are the youngest, and they grow near the tips of the twigs. The double mittens have a thumb on each side, and the simple oval shape—the hand part with no thumb at all —is usually harder to find than either of the others.

When looking for these strange leaf shapes, there is always a chance of coming upon a strange inhabitant of the sassafras tree. A great green caterpillar is lying at ease upon a hammock of silk, which he has spun for himself. There he lies, and gazes at the startled person who discovers him. Are those really eyes, or only black spots? They probably scare away birds which are looking for worms. The effect of the two "eye spots" is almost as surprising as if two

rolling eyeballs glared at the intruder, and threatened violence if he came near.

Carry home this fearsome green mummy on the leaf; put him in a cage made of wire screen, and watch him. He needs no food, for he is asleep. When he awakes his mummy case will split open, and out of it will emerge a wonderful butterfly, with banded wings of black and yellow velvet, and long, tapering points trailing behind, which gives him his name—the swallow-tailed butterfly. He has a flexible tongue, an inch or more in length, coiled like a watch spring. With it he will probe the tubes of flowers, and find the nectar at the base of each. He is hungry now, so let him go. Turn him loose in a bed of flowers, and you may see just how he feeds.

When the mother butterfly laid its tiny green egg on the face of an open leaf of the sassafras, the tree was probably in blossom. In June, delicate, starry, greenish-yellow flowers come out in clusters on the ends of twigs. The butterfly finds nectar in these fragrant and dainty blossoms. In the autumn birds come and feast upon the blue berries which look very handsome on their red stems. Indeed, it is quite usual for the trees to be stripped while the berries are still green, so hungry are the birds that stop to feed on their long journey to the South.

In the autumn the sassafras trees change colour from the brilliant green of summer. All colours of the sunset, purple, red, and golden, blend in these shining tree tops. A clump of sassafras and sweet gum trees, with here and there a tupelo and a dogwood, a scarlet oak and a hard maple, make a picture never to be forgotten. If the roadside trees were on fire, they would not show any more vivid colouring. It is their glorious good-bye to the year, before they all let their leaves fall and enter into the sleep of winter.

THE ASH FAMILY

The trees whose leaves are set opposite upon the twigs are few in the American woods compared with those whose leaves alternate. The maples have the opposite arrangement of leaves; so have the dogwoods. These trees have simple leaves. The horse chestnuts and buckeyes have their leaves set opposite, and these leaves are compound: five or seven leaflets rise from the end of the stout leaf stem. The ash family is another large group of trees, with leaves set opposite on the twigs. These leaves are compound, but of a different pattern from those of the horse chestnut. The leaf stem has the leaflets arranged

in pairs along its sides. This is the feather type of compound leaf, seen in the locust family, and among walnuts and hickories.

Ash trees are recognised by their opposite compound leaves. There is another sign: the fruit has a dry seed, pointed and winged like a dart. There is no other seed exactly like those of the ash. The seed clusters hang on the bare twigs, far into winter. The twigs are stout, and set in pairs on the branches. The trees grow large, and their tops are regular and handsome. The bark is close, broken by shallow fissures into small, often diamond-shaped plates.

Our common ash trees are distinguished by colour, as the names indicate. A few well-marked differences are shown by the species, which are often found growing together in mixed woods.

The white ash is a tall, handsome, stately tree, with a trunk like a grey granite column. The white in its name is from the pale leaf linings, that illuminate the tree top in summer. The twigs are pale, and the bark is often as pale grey as that of a white oak. The slender, dart-like seeds are one to two inches long, with a wing which is twice the length of the round, tapering seed. They hang in thick clusters, paler green than the leaves, and often flushed with a rosy tinge in late summer. All winter the wind harvests the

crop of seeds, and plants young white ashes wherever the darts fall on good ground.

The black ash is a slender, upright tree, with narrow head and stout twigs. The plump, leathery buds on the winter twigs are almost black, and the bark is a very dark grey. The foliage in summer is much darker green than that of any other ash, so the name is earned by buds, bark, and leaves. The seeds are flat and short, and the wing is broad and short, and deeply notched. A black ash leaf has all its leaflets stemless except the one at the tip. The white ash has a much fleecier foliage than that of the black, because each leaflet has a stem of its own.

The wood of the black ash splits readily into thin sheets, each representing the growth of a single year. The Indians taught the white men to make baskets out of black ash splints. They cut the tree down, sawed the log into the lengths required, split the blocks into pieces as wide as the splints should be. These sticks were bent over a board, and the strain separated the bands of dense, tough wood into the thin strips just right for basket weaving.

The red ash is a small, spreading tree, with a close head, slender branches, and crowded twigs. Its bark is reddish, closely furrowed, and scaly.

The young twigs are covered with soft hairs. The leaves are a shiny yellow-green above, often a foot long, made of seven to nine slender leaflets, whose stems and veins have a silky down, that remains all summer.

Red ash seeds are extremely slender and long, and they hang on hairy stems.

The green ash has dark, lustrous foliage, the leaf lining green, like its upper surface. The bark is grey, and closely checked, and the twigs are smooth and slender.

This is the ash tree which grows in the regions of scant rainfall; in Utah, Arizona, and Texas. In the East it is found from Virginia to Florida. It is one of the beautiful shade trees in the regions where few trees grow well. East of the Alleghenies it is but one among many ash trees, and is little noticed; but in the far West, and on the treeless plains of Nebraska and Dakota, it is a far handsomer tree than its companions, the willows and the cottonwoods.

The blue ash is common on the rich river lands along the principal tributaries of the Mississippi. Some of the finest specimens grow on the limestone hills of the Smoky Mountains. It is a tall, graceful, grey-stemmed ash. We shall know it anywhere as an ash tree by its opposite twigs and leaves, and by its dart-like

Fruits, leaves and flowers of basswood tree, called also linden

Chestnut trees blossom in July, and the nuts drop after the first severe frost

fruits. It differs from all other ash trees in having four-angled twigs. The tree has a kind of blue dye in its inner bark. Cut out a piece and put it in water, and it is as if you had added a few grains of indigo.

The blue ash ranks high as a shade tree, and its wood is quite the equal of white ash. It is used for vehicles, for flooring, and for tool handles. It is especially desired for pitchfork handles.

The native ash of Europe is a large timber tree, whose range extends through Asia Minor. The wood of this tree had a wonderful reputation for general usefulness. Its tough, thin inner bark was used to write on before paper was invented. The wood was used for lances and spears, for bows, pikes, and shields by the soldiers, during ancient times. Every tool, vehicle, and implement of the farmer and mechanic were made of this wood. "Every prudent lord of a manor should employ one acre of ground with ash to every twenty acres of other land. In as many years it would be worth more than the land itself."

The seeds of ash trees were used for fattening pigs. They were also used as remedies for many diseases. They were called birds' tongues, from their shape, and every apothecary kept a stock

of them. Ash wood makes the best of fuel, and its ashes, rich in potash, make a splendid fertiliser, especially in orchards.

One warning the old English rhyme offers regarding this tree. It is supposed to attract lightning. Oaks have the same reputation. On the other hand, tradition holds that a beech tree is never struck by lightning. There is opportunity, where these trees grow, and where thunderstorms are frequent, to notice how true are the popular beliefs.

Have you ever been warned by this old rhyme?

"Beware of the oak, it draws the stroke;
Avoid the ash, it courts the flash;
Creep under the thorn—it will save you from harm."

THE HORSE-CHESTNUT AND THE BUCKEYES

When an English lad speaks of a chestnut, he means the horse-chestnut, and the chances are that he does not know anything about the American trees, whose sweet nuts we gather in the woods at home after the frost has opened their spiny burs. In America the European tree is planted very commonly for ornament and shade, and it is always called horse-chestnut here, except by English cousins who may be visiting us.

They ask us why we put the word "horse" before this tree's name. For answer we pull down a twig, snap off a leaf, and show the scar of the leaf's attachment to the twig. It is somewhat like the print of a horse's hoof on the ground. Even the horseshoe nails are there, for a thread from each leaflet goes down through the leaf stem, and its fibres are buried in the twig. There are five or seven of these nail prints in the scar, depending upon the number of leaflets. Five is the usual number, but seven is not at all unusual.

An old tradition states that the people of Eastern countries feed these chestnuts to their horses to cure them of cough, shortness of breath, and other lung disorders. Upon this is based a second claim for using the word "horse" before this tree's name. The quality of the fruit, however, is probably the best answer to the question. The coarse, large nuts are not fit for human food. It is quite common to think that horses can eat things too rank for our more fastidious taste. Horse sugar is the name of a small tree whose sweetish twigs are browsed upon by cattle and horses in wooded pastures. Horse-radish and horse-mint are coarser, more rank-growing kinds of plants, than their closely related species which are used for human food.

We shall know the horse-chestnut in the dead of winter by the large buds, the large hoof-print leaf scars, and by the pyramidal form of the tree. The twigs are stout, and they turn upward so that the largest of the varnished buds are held up like candles. The main branches leave the trunk with an upward curve, then bend outward and downward, then up again to hold the buds upright. The tree looks, therefore, like a great complex candlestick, with many arms and many candles. The twigs are stout, and they come out opposite each other on the branch. This is a peculiarity of few trees. It belongs to all of the members of the horse-chestnut family, which includes the buckeye trees, our native horse-chestnuts.

In early spring, watch the horse-chestnut tree outside your windows and along the streets as they begin to swell, and until they finally open. The tree lights all its candles when the brown, varnished outer bud scales fall, and the soft, silky inner ones, yellow as a candle flame, are revealed. On the side twigs the buds are smaller than on the tips. Out of each small bud comes a bunch of leaves. Out of the big buds come the flowers.

In June a big horse-chestnut tree holds up a thousand pyramids of white blossoms. Below each flower cluster is an umbrella-like circle of

leaves. Each blossom of the dense spike has in its throat dashes of yellow and red. The petals form a ruffled border. The curving stamens are thrust far out. Bees come in search of pollen and nectar.

After the flowers pass, green fruits appear, a few in a cluster, and all covered with spines. Not many of these reach full size. It seems to be enough for the tree to ripen one or two fruits in a cluster. In the autumn they turn brown, and the husk splits into three equal parts. Out of this spreading husk the brown nuts fall.

Now the boys assail the tree with sticks and stones, and the harvest of nuts is on. Who does not love them for their beauty alone? The great white spot is the place where they were attached to the husk. The kernel is as bitter as gall, and I know of no animal which eats it. If any one counts them useless, let him see the hoards of them which children gather, and use in their play. He will change his mind completely. Their glowing, soft colour is a feast to the eye, and they just fit the hand.

THE BUCKEYES

The Ohio buckeye is a little tree, but it has given its name to the Buckeye State. There must

have been many of them in the virgin forest that the Ohio pioneer cut down to make room for his crops of corn and grain. He noticed these trees particularly because of a disagreeable odour that comes from the bitter sap. The chopping and handling of these trees intensifies this odour, which is noticeable even when one drives past a growing tree.

The name was given by some imaginative person who saw a resemblance between the smooth brown nuts and the soft brown eyes of a buck. The white of the eye corresponds to the dash of white on the nut. Deer abounded in the virgin forests, and no doubt it was one of the first settlers, a hunter as well as a farmer, who named the tree.

The flowers and leaves resemble those of the horse-chestnut, but are smaller, as the tree is. The number of leaflets is five, rarely seven, and they cluster on the end of a long leaf stem. The flowers appear in April and May, and are not conspicuous, for they are yellowish-green, and make little contrast with the new leaves.

One thing is to be said in favour of this ill-smelling tree. Its wood has been found to be the best kind for the making of artificial limbs. To this special use the lumber is chiefly devoted.

The sweet buckeye lacks the disagreeable odour

of the Ohio buckeye, and its nuts are eaten by cattle. It is a handsome, large tree, with leaves of five slim leaflets, more or less hairy below, and on the veins above. The flowers are yellow and showy. Each corolla is drawn out into a tube, like a honeysuckle's. The husks of the nuts are smooth. This species grows from Western Pennsylvania along the mountain slopes to Alabama, and on the prairies westward to Iowa. The nuts are full of starch, and these are ground into flour, which is used by bookbinders in making their paste. The reason why this paste is preferred is that destructive insects do not eat it as they do paste made of wheat flour.

A red-flowered buckeye tree of small size grows wild from Missouri to Texas, and east into Tennessee to Northern Alabama. This is not the same as the red horse-chestnut, which is sometimes seen in cultivation as a handsome tree, twenty to thirty feet high.

In the far West, the California buckeye is a wide-topped tree of good size, with leaves of the true horse-chestnut type, and white or rose-coloured flowers, in showy clusters, and smooth, pear-shaped nuts. This is the only one of our native species which grows beyond the Rocky Mountains.

THE LOCUSTS AND OTHER POD-BEARERS

When you find a tree with flat pods, containing a row of seeds, you may be sure it is a locust, or one of the family to which locusts belong. It is a near relative of the peas and beans that grow in the vegetable garden. This is a great and valuable family to the human race, for it furnishes some of the most valuable foods upon which the people of all countries live. Only one family, the grasses, is more important. This includes not only grasses that are used for making hay, but all the grains—wheat, barley, rice, oats, and corn, that make the bread of the world, and forage crops for horses and cattle. The banana and sugar cane and bamboos are in this wonderful grass family.

Along the roadsides, along rivers, and in the woods grow the black or yellow locusts that bloom in June, covering their ugly limbs with a cataract of white, pea-like blossoms, in large clusters. All summer the slim, thin pods are velvety and green, with a lovely flush of rose, as they swing among the feathery, fern-like leaves. In autumn the pods turn brown, and in winter, when the wind can switch them against the bare twigs,

they split, and one by one, the hard little seeds are shaken out. They are too heavy to be carried in the wind. So we see little locusts coming up among the old ones, and on the outer edges of the clump.

No tree is so discouraged-looking, unkempt, and diseased as a black locust infested with the borers, and stripped of the foliage that covered its thin, irregular limbs in the summer time. The buds, even, are hidden, and the tree looks as if life had left it. But the late spring denies the rumour by clothing the dead-looking twigs with foliage whose tender shadings and delicate leaf forms make it one of the most graceful and lovely of all native trees.

Unfortunately, we cannot have locusts of this species in this Eastern country without exposing them to the attacks of insects against which we cannot defend the trees. The eggs are laid in clefts of the bark, and the grubs hatch quite out of reach of poisons and other damaging spraying solutions. They feed on the living substance under the bark, and their presence is shown by swellings above their burrows. Twigs, limbs, and trunks are distorted, and gradually the tree loses vitality, and the wood is made worthless by the honeycombing it receives. Only in the mountainous parts of its range does the black

locust reach its best growth. No tree has better lumber for posts and other uses requiring durability in contact with the soil and with water.

The clammy locust is a pink-flowered species with a sticky substance exuding from the hairy surface of new shoots. The flowers are lovely but scentless. The trees are much planted in parks and on lawns as an ornament, in all temperate climates.

The honey locust earns its name in the summer time, when the curving green pods are full of a sweet, gelatinous pulp. Boys would like to get these honey pods, but the vicious thorns permit no climbing of the trees. Stoning and other throwing of missiles is a slow and unsatisfactory means of obtaining the forbidden fruit that hangs so high. By the time they ripen and fall off the pods are bitter as gall.

An old-world relative has thick, purple pods, which are sweet and palatable when ripe. These are brought to this country, and sold on small fruit stands under the name, St. John's bread. It is said that this was the food of John the Baptist in the wilderness.

The Kentucky coffee tree is the coarsest member of the locust family in our woods. Its pods are thick and short, and the seeds inside are as large as hazel nuts. In the story of the Revolu-

tionary War, the patriotic citizens refused to pay duties on imported goods. The seeds of this locust were used as a substitute for coffee. I have tasted the bitter outside of one of these nuts, and tried to break one with a hammer, but unsuccessfully. It is not easy to understand how a beverage made of such a nut could have been fit to drink. The name of the tree seems to give colour of truth to the tradition.

A coffee tree much like our native species grows in China. We may believe that it is called by another name, for the people use its heavy pods for soap. Whether green or ripe, I do not know.

The club-like branches of our coffee tree give it a burly, clumsy appearance in winter, when nothing conceals them from view. The dangling pods rattle against the bare, stubby twigs, calling attention to their lack of grace and symmetry. Even the buds are out of sight, buried under the thin bark, just above the big leaf scars. All winter the wind strives with the stubborn pods. When one is torn off, it lies unopened until melting snow softens it, and the horny seed lies long before it is able to sprout.

A thin pod adorns the most delicate of the locust trees. This is the little red bud, a flat-topped tree, of slender, thornless branches, most

of them horizontal. Early in spring this tree earns its name. Quantities of rosy magenta, pea-shaped flowers cluster on its slim, angular twigs, quite covering the smaller branches. It is an unusual colour, and an unusual time to see pea-blossoms. You cannot forget it, if you have seen the tree once.

The leaves that soon follow are as unusual as the flowers. Roundish, heart-shaped, smooth, and shining as if polished, they flutter on thin, flexible stems, and the slim pods hang among them. They ripen and turn from green to rich purple when the leaves change to bright yellow. The hard little seeds are close together in the pods, so that they are numerous, though the pods are but two or three inches long.

I do not know when the red bud is most charming. Certainly its autumn garment of yellow is beautiful, trimmed with a fringe of purple pods. It is a royal robe, and so fresh and new-looking when the foliage of so many larger trees is faded and in tatters. The trees that hide in the shelter of larger ones can often save their leaves from wear and tear, and this the red bud does.

Judas tree is the name by which the red bud of Europe is commonly called. It is one of a few species to which an ugly tradition has been

fastened by custom. It is said that this is the kind of tree upon which Judas Iscariot hanged himself. Our little American tree has had to share the disgrace, for it looks like its European cousin. The name to use is the true one.

Nurserymen have imported a large-flowered red bud from China. Its flowers are not only more showy, but they have a paler, prettier colour —a rosy pink, and lacking the sad, blue tone of the others.

It is easy to raise red bud trees, and they are admirable in the border planting of a garden or lawn. They begin to blossom when quite young, and they never grow so large as to be out of place among shrubbery.

The yellow-wood has larger and lovelier blossom clusters than the black locust, with which it might most easily be confused. In autumn the flower stems hang full of thin pods, one to three seeds in a pod. No other locust is so scantily supplied with seeds in a pod.

In summer the leaflets prove that the tree is not a black locust. They are larger and fewer, though of the same feathered type. In the seasons when the tree blooms freely, which is by no means every year, the twigs are loaded with clusters larger than any black locust produces. In winter it is the bark that distinguishes

tree. It is grey and smooth, like that of the beech; not at all like the dark trunk and rough limbs of the locust. The form of the tree is a regular head of horizontally-spreading limbs, ending in tapering twigs that droop gracefully. It is one of the handsomest trees in winter. The locust is one of the weediest and ugliest of trees when bare.

To find the yellow-wood in its native haunts, we must go to the mountains of Eastern Tennessee and North Carolina. It goes farther north and south, but its range is scant. Better chance of our meeting it in our neighbour's yard. It is cultivated as a flowering tree by people who appreciate the finest trees that grow wild in American woods. The nurserymen call it Virgilia. This is certainly a graceful name, fitted to a tree that deserves only the best.

The catalpas are pod-bearers of a different type. Their long pencils are green, and there is no sign of splitting until autumn. The seeds are not like those of the flat pods, set in a single row. They are thin as tissue paper, and packed in overlapping layers about the thin partition that divides the pod into two compartments.

The pods hang on after the large, heart-shaped leaves fall. Winter winds bang them against the few and their two sides separate lengthwise.

Gradually the thin, two-winged seeds escape, and are scattered. The sowing lasts a long time.

Willows and poplars have pods of a sort, but like neither locusts nor catalpas. The seeds are very minute in each family, and carried in delicate wisps of cottony down. The pods open by splitting down their walls, along two or four lines, curling back the dry segments, and thus letting the seeds escape. These trees are early in scattering their seeds. The true pod-bearers are late about it.

WILD APPLE TREES AND THEIR KIN

Go out into the woods, and you will find wild crab apple trees, bearing hard, sour little apples, unfit to eat. Four distinct kinds are native to this country. In Eastern Asia wild apple trees grow in greater variety than here. Our orchard apple trees are descended from these Oriental wild apples, which were brought under cultivation long before America was discovered. Nurserymen in Europe and Japan have for centuries worked with the wild species to improve them. The Japanese worked to produce finer flowering trees. European horticulturists desired fi[illegible] larger fruit. American orchards sh[illegible]

they have succeeded. For over a century American horticulture has made marked progress. Many valuable kinds of fruit have originated in this country. Our own wild apples are now studied with the aim of bringing them into cultivation, just as the Asiatic species were improved centures ago. It is a wonderful work, accomplished by crossing, grafting, budding, by fertilising, and good tillage,—processes too special to be explained in this book.

The taming of wild apples, however, is one of the great achievements of the centuries. Every boy and every girl who enjoys the eating of a fine apple will wish to know how such glorious fruit, in abundance sufficient to supply the world's needs, has been produced from such unpromising beginnings as the gnarled little crab trees scattered through the woods, and dwarfed by the larger forest trees that overshadowed them.

" Grafting " or " budding " a little tree insures that the fruit it bears later on will be of the variety of the tree from which the scions came. Only once in a long while does a good variety of fruit come on a seedling tree. Plant the seed of the best apple you ever ate, and then wait a dozen years or more for this tree to bear fruit. leaves fa- chances are ninety-nine to one that the apples few and the be miserable, sour, or tasteless nub-

bins, like the roadside apples, that nobody planted. It is too expensive to experiment in hope of getting good varieties from seed.

"Johnny Appleseed" was a funny old fellow who wandered up and down the Ohio valley states, and planted apple seeds wherever he went. Queer, and perhaps crazy, he was a kindly soul, who dreamed of the days when orchards should dot the landscape, and be a part of every farm homestead. He did what he could to make the wild prairie wilderness blossom and bear fruit. No doubt many pioneer orchards came from his planting. Seedling trees, all of them, for he believed firmly that it is *wrong* to graft a tree!

Each year better and bigger apples are shown at fairs, and fruit shows. The history of apple culture is full of interest. It requires hundreds of books to tell the story. But any man who has an orchard can tell you how his trees were made into the varieties he ordered at the nursery. He may show you how grafting and budding is done, and how a tree may be made over in a few years to change entirely the kind of apple it bears. He may show a tree that bears distinct kinds of apples on different limbs, and show you the scar of the graft from which each new variety has sprung. When you are old enough, grow apple trees from seed, and

them to the variety you choose,—greening, russet, northern spy—taking your scions from a tree whose apples are especially fine. It is a fascinating game to play, with the soil, and the sun, and the rain all working with you to help you win.

Meanwhile, the wild apple, though worthless as a fruit tree, is well worth knowing. No well-fed orchard tree has charm to compare with this wild thing when spring transforms its ugly, thorny twigs.

The rosy blossoms of the wild crab apple come out of a multitude of coral-red buds which open just after the leaves. The gnarled limbs are bare and ugly, until late in May. Then the silvery, velvet leaves unfold, scarcely green at first, because each one wears so thick a garment of soft, white hairs. Before the leaves have lost this velvet coat, the flower buds begin to glow, and the tree top is soon blushing with the blossoms, and the air is full of their spicy fragrance.

Their charm is the charm of the wild rose. Their arrangement on the gnarled twigs is irregular. The artist loves the unstudied grace of it. The great botanist, Linnæus, probably saw only dressed specimens, but he named the tree *coro-*

leaves ha. which means, "fit for crowns and gar-

few and th

An old apple orchard is a fairy land indeed when blossoms cover the trees

Nothing tastes so good as ripe apples picked right off the tree!

I remember gathering the little green apples in the fall. Hard, and almost bitter, when eaten out of hand, they make a jelly that is as distinct and delightful in its way as the flowers are more admirable than common apple blossoms. The taste is wild, and almost bitter, but beside it ordinary apple jelly tastes insipid. Perhaps I am prejudiced, and the memory of that wild crab-apple jelly too remote to be depended upon. But many people agree with me. If you are in the woods in October, and come to a thicket of trees bearing flat, yellow apples, pick as many as you can carry home. Smell their spicy fragrance, and persuade your mother to make them into jelly, so that you can form your own opinion of it.

The Eastern crab apple grows over a large part of the region between the Atlantic coast, and the dry plains east of the Rocky Mountains, and south to Northern Alabama and Texas. The prairie crab, a different species, grows in the Mississippi Valley. A narrow-leaved species grows in the South, and the Oregon crab is the native wild apple of the woods, from California north into Alaska.

Quinces are core fruits, cousins of the apples. So are pears. All of our orchard pears and quinces are cultivated varieties of species that

once grew wild in Europe or Asia. The Japanese quince in America is a hedge plant which in spring covers its bare twigs with large, deep rose-coloured flowers, and bears hard, freckled fruits that smell better than they taste, in September. We know all these fruits, and have them in our gardens, but they are foreigners here, though much at home. We have no native pears or quinces in America.

THE CHERRIES

Do you know the peculiar taste and odour of the pit of a cherry or peach? Then you will recognise it without difficulty when you meet it in a bruised leaf or twig of any tree that bears stone fruits, wild or cultivated. It belongs to the family which includes plums, cherries, peaches, apricots, and almonds. But one species of native cherry is a large tree. It is chiefly as fruit trees that the cultivated varieties are important. A few are grown for their beauty as flowering trees and shrubs; some for their rich bronze foliage.

The wild cherry is the one lumber tree in the family. Its wood ranks with mahogany, though not so expensive as the tree which grows no nearer to us than lower Florida and Central

America. It is made into furniture or used in the interior finishing of houses, parlour cars, and ocean liners. It takes a beautiful polish, and has a rich brown colour that improves with time. It is largely used as veneer on cheaper woods. "Solid cherry" is likely to be birch, if the article is of modern make.

This cherry has dark, shiny bark when young, which breaks into shallow furrows, and curls back like birch bark. The unquestionable sign by which to know a wild cherry is the bitter, peach-pit taste of the sap. Nibble a leaf or twig or bit of bark, and you get that unforgetable taste, that stays on the tongue longer than we like.

Birds feast in September on the long clusters of dark purple berries. They are bitter sweet, barely edible, I say. But birds take them thankfully, and children usually eat them freely. Old-fashioned people make them into wines or cordials for home remedies.

The choke cherry is a shrubby tree, with a rank, disagreeable odour added to the bitter and pungent odour that belongs to the black cherry. The leaves are twice as wide as the black cherry's. The fruit shares the rank quality of the leaves and bark. Until dead ripe, the cherries are so bitter, harsh, and puckery that children, who eat

the black cherries eagerly, cannot be persuaded to taste choke cherries a second time. This is well-named the "choke" cherry. Only the birds can eat the berries without choking. They seem not to mind its rankness, for the fruit is all taken by the time it has turned black-ripe.

Early in summer the red bird cherry is in fruit, after its crown of white blossoms has passed. The pit is large, and the flesh thin and sour, and the whole fruit is discouragingly small. But birds are happy among the shining leaves until the last cherry is gone. This is quite sufficient appreciation. The seeds are dropped, and the little trees come up all through the woods and in the most unexpected places, due to the birds' scattering of the seeds.

Garden cherries of the sweet and sour groups have sprung from wild species that grow in Europe. The red, black, and yellow cherries of California are the largest, most improved varieties. The garden cherries of the Eastern states are not nearly so large.

The native cherry of Japan has been cultivated as a flowering tree, until it is wonderfully beautiful. In its season of bloom, Japan is a perfect fairyland. The country is one great garden of pink cherry blossoms. At this time the people turn out to see the marvellous sight.

A national holiday is dedicated to this tree, which is the symbol of happiness in the Flower Kingdom.

THE PLUMS

All plum trees are small in stature, and many are thorny by the sharpening of side twigs, as if the struggle with adverse conditions made it necessary to carry weapons of defence. I speak now of the wild species. They grow in thickets, another habit of self-protection.

The wild red and yellow plums that still grow in thickets along streams in the great middle country between the East coast and the Rocky Mountains, furnished an important article of food to the pioneer families, which led the westward march of civilisation, and founded the prairie states. Only people who remember those times, and actually took part in the work of the pioneer, can know how valuable the wild fruits were, while the young orchards were growing, and no fruit was to be had for the greater part of the year.

After the first heavy frost in September the plums were fit to eat. They became soft, and sweet, and pleasant in flavour. But the skin was thick, very sour and puckery, so eating plums was not an unmixed joy.

When a team and part of the family could be spared from the farm work, a day was taken for "plumming," and a happy and laborious day it was, but always enjoyed in true holiday spirit. Usually neighbours joined in the outing, and had a picnic dinner together in the woods. Only the oldest clothes were worn, for in the plum thickets one must risk the ruin of his raiment by the angular, thorny branches. Sheets were spread under the trees where possible, and a severe shaking or beating of the branches showered the fruit down. All hands were busy at gathering the plums, and loading the waggons with the harvest.

Perhaps there was time afterward for the boys to explore the hazel thickets, and gather a generous bagful of these small, but deliciously flavoured nuts, still in their husks. Wild grape vines, loaded with the purple fruit, tempted the frugal wife to strip them, even though the sun was low. For days after the return home, she was at work putting away for winter use preserves and jellies and pickles, and good old-fashioned plum and grape "butter," sweetened with molasses made from sorghum cane.

Little plum trees, dug in the woods in early spring, were planted in the home garden. By setting these carefully, and tilling and enriching

the soil around them, larger trees and finer fruit were produced than the wild plum thicket could show. Some of the good cultivated plums have had such an origin.

A half dozen different species of wild plum grow wild in different soils and regions of the United States. Where two grow in the same territory, natural hybrids have originated, better than either parent in the quality of their fruit. Such a cross has given rise to several varieties of garden plums, of which the Miner group is a fair example. The best orchard plums for the middle of the country are crosses between native and Japanese species. The European species, like Damsons and Green Gages, do well in the Eastern states, and on the Pacific slope.

The prunes we buy are dried plums. For a century or two France has led all countries in the prune industry. Now California leads. The kinds of plums that can be dried are sweet and fleshy. Ordinary juicy plums cannot be made into prunes. The hot sun of California soon takes all the moisture out of the plums spread on tables to dry. There is no rain to fear in the hot summer months.

Peaches, nectarines, and apricots are stone fruits, closely related to the plums and peaches. These Old World fruits are grown in the warm

parts of this country. California raises them in quantities. The most profitable of the stone fruits has woody flesh, and is raised for its pit, which we eat. This is the sweet almond, a valuable nut. Its related species, the bitter almond, yields almond oil and hydrocyanic acid, both important drugs.

THE SERVICE BERRIES

In the same family with apples and plums and cherries is a group of slender, pretty trees called June berry, service berry, and on the East coast, shadbush. When the shadbush blossoms white, the fishermen know that it is time to expect the shad, which are taken in nets when they run up the rivers to spawn. The red berries are ripe in June, and the birds celebrate the event, and even take them before they begin to redden. Competition is strong, and the supply never equals the demand. Rarely can a human berry-picker find a ripe berry, to discover how it tastes.

The charm of this little tree is that it covers its slim branches so early with white blossoms. The clusters are soft and feathery, and a warm flush underlies the white, the ruddy, strap-shaped bracts, two of which are under each flower. The

dainty opening leaves are also ruddy, and these have opened before the blossoms pass.

In early April it is worth a long walk or drive through the woods to see the scattered service-berry trees standing out from the bare background of leafless trees, lovely as any tree can ever be, in their robes of white. Thereafter, they seem to retire from view, engulfed by the foliage curtain the woodland draws about itself, as spring advances.

VALUABLE SAP OF TREES

In early spring on the New Hampshire hillsides, the sap begins to mount the trunks of the sugar maple trees, dissolving the sugar stored in the wood cells during the previous summer. It is time for the making of maple sugar. Winter is over. Spring work has begun.

Hundreds of twigs of elder have been cut in short lengths, and the pith pushed out, to make "spiles." Holes are bored in the trunks of the trees, and in each hole one of these hollow spiles is driven. These are the little spouts that drain the sap from the tree into the waiting buckets that stand or hang below. Drip, drip, drip, the sweet sap flows into the buckets; and as often as they fill, the farmer makes the rounds of the trees

with barrels on a low sled or "stone boat," emptying the buckets.

The sap he gathers is poured into the evaporating pans in the sugar house, and a roaring fire keeps it boiling. As the water goes off in steam, the remainder becomes maple syrup, which thickens as it boils. Skimming and straining removes any dirt or chips that fall into the sap. When it is just thick enough, the syrup is drawn off into cans, and sealed to be sent to market. A part of it, however, is boiled longer, and when drawn off, and cooled, it crystalises into the granular yellow maple sugar. It is cooled in shallow pans that hold a certain amount, and thus the bricks of maple sugar are formed. Little heart-shaped cakes are made by filling "patty pans" with this heavy syrup.

As long as the sap flows in sufficient quantities, the sugar harvest goes on. If the trees are bored with care, with holes not too close together, the tree will stand this draining from year to year, and seem not to be injured by the loss of sap. If the holes are close together, and extend all around the trunk, the tree will be practically girdled and it will die from the injury.

The finest kind of maple sugar is the wax which is made by pouring heavy syrup on the snow to cool. Quickly it thickens by the cold

into stringy yellow wax, which tastes like other maple sugar, but does not have the unpleasant gritty feeling, which sets some teeth on edge. Maple wax may be made at home, by melting the sugar, and pouring it into snow; but the time and the place to enjoy it most, is in the sugar camp when the hot syrup is poured from the long-handled ladle onto the nearest snow bank by the person who is in charge of the boiling. The cold air of the woods puts a keen edge on the appetite. The warm fire under the boiler takes off the chill, and the silent woods all around give a charm to the scene which one does not feel in any other place.

Hickory sap is sweet. This is sometimes added to that of the maples when maple trees are scarce.

The sap of pine trees is a liquid called *resin.* The pine forests of the South are rich stores of this resin, which we call also pitch. The crude liquid drained from these trees is heated, and a light liquid called *turpentine* is drawn off. The remainder hardens, and is known as *rosin.* The pine trees are tapped, not as the sugar trees of the North are, but in a way that is far more injurious to the trees. Resin hardens into gum when exposed to the air, so it is impossible to draw it out through small tubes like spiles of elder that

drain the maple sap. A great gash is cut in the side of the trunk of a pine tree, forming a pocket holding three pints or more. Now a square foot or more of the bark above the pocket is cut off, and the wood is chipped to a depth of an inch or more. The bleeding surface of the wood fills the pocket below with resin, and a man comes around with pails and dipper to empty these pockets as fast as they fill. The pails are carried to a still, where the resin is poured into a tank and heated to draw off the limpid turpentine.

Once a week, from March till November, more bark and wood, above the scored surface, must be chipped to renew the flow of resin. If this fresh wounding did not occur, the flow would cease, because the resin thickens and hardens when exposed to the air. This stops up the pores of the wood.

Fortunes have been made by the draining of these pine trees of their rich, pitchy sap. Turpentine and tar and rosin are all products of the sap of pines, and all are immensely valuable, especially in shipyards, and in the provisioning of sea-going craft of all sorts. The term, "naval stores," has been applied to the products of turpentine gathering. Our forests supply most of these products to other countries.

The sap of certain tropical trees hardens into rubber. This is one of the most valuable of tree crops, for there is hardly a household that does not have rubber articles of a dozen kinds that are daily used. Lacquer varnish is the juice of certain sumach trees that grow in Japan. Gums of fir trees have a special use in medicine, and in various arts.

Sweet gum oozes from trees of that name. This is not noticeable in our trees of the North, but if we follow the trees southward, the gum flow increases. In Mexico it is an article of commerce, obtained by wounding the bark of the trees. It is one of the staple glove perfumes in France. It is also made into medicines, perfumes, and incense.

The sap of wild cherry, holly, and buckthorn, of witch hazel and sassafras all yield medicinal drugs. The flowers of locust, of basswood, and all the fruit trees furnish nectar out of which bees make honey. The juicy inner bark of the slippery elm is valuable for food, and as a medicine.

THE USES OF TREES

Imagine a stranger who has lived all his life in a desert where no trees grow, coming suddenly

into our village, and looking with wonder at the trees that shade the streets. He knows only the spiny cactuses, and other plants of the desert. His first question would be, "What are these great plants that stand so tall?" The name, *tree,* is new to him. It would be a strange experience to take such an eager and ignorant man and show him the trees, on the streets, planted in orchards, and growing wild in the woods outside of the town. His questions set us to thinking. He wants to know why we plant trees, and how we use those that grow in forests.

First, we tell him the uses of the living trees. Up and down the streets they are set for shade, and for their beauty. Rows of evergreens set close together make a protecting wall of green against the cold winds. Low clipped hedges of many kinds of trees make living boundaries, much more beautiful than wooden or wire fences. On lawns and near houses trees are planted for their beauty and for their shade. Orchards of fruit trees are planted because they furnish food. Nut orchards are set out for the same reasons.

The trees cut down in the woods, and sawed at the mills give us lumber to build houses to live in, and furniture to make them comfortable, and the same forest furnishes the fuel that keeps us warm. There is so much to explain to a

person who discovers trees for the first time. It takes a long time to tell all we know.

Do we think that we know a great deal about the uses of trees? If so, we are mistaken. The truth is that trees serve us in ways of which we have never dreamed.

We must travel over the world and read a great deal to learn how the people of other countries make use of trees. The basswood or linden which nobody cared to use except for fuel in the Middle West might pass for a useless tree, compared with those whose wood is harder and stronger. But in older countries people have quite a different opinion of the tree.

In Russia the tough bark of young lindens is used to make the shoes of peasants. Ropes, fishing nets, and braided mats are made from the same tough "bast" fibres, which are very long and tough in this family of trees. The seeds yield oil that is declared to be quite as good as olive oil for cooking, and for the table. Perfume is distilled from the flowers. Cattle browse on the twigs and leaves. The wood is the carver's delight—soft, white, free from knots and imperfections. It is used for bureau drawers, carriage bodies, shoe soles, barrel staves and paper pulp. Its twigs make artist's charcoal pencils.

Linden trees are planted for shade in many

countries, and in Europe they are often cut into grotesque shapes of animals as they grow. They are clipped into hedges, as close as box or yew. In America they are usually allowed to grow naturally, as shade trees. European species are rather more symmetrical than our native kinds.

The Indians of the Northwest used the soft inner bark of the tamarack pine for food. They cut down the trees, strip them of bark, and scraped out this soft lining layer. With water, they mash it into a pulp, which they cook and then mould into large cakes. A hole is next dug in the ground, lined with stones, and a fire is built in it. When the stones are hot, all ashes are removed, and the cakes, wrapped in green skunk cabbage leaves, are laid in. A fire of damp moss is built on top, and thus the cakes are thoroughly baked. To insure their keeping, they are next smoked in a close tent for a week or more. This dries and cures them so that they may be safely packed away for future use. These hard, dry cakes are afterward broken into pieces and boiled. When the mass softens and cools, it is ready to eat. The fat of different animals is used for butter on this strange Alaskan bread.

Everybody knows that trees bear fruits of many kinds that are useful as food for men and

Flowers and fruit of the wild black cherry

The delicate white flower clusters of the service-berry tree

beasts. Spices, such as nutmegs, mace, cloves, and allspice, may be added to this list of fruits which we have as human foods.

The bark of birches is invaluable to the Indians for the making of their canoes, baskets, and all kinds of utensils. Huts and teepees are walled with it. Rope and coarse cloth are made out of the fibre of mulberry bark, and berry baskets out of the bark of the lodgepole pine. The fibrous roots of the larch tree furnished tough thread, with which the Indians sewed canoes of birch, and they made them water-tight with the gum of the balsam. The brown gum that oozes from wounds of the Western larch is sweet and starchy. The Indians discovered in it a valuable article of food.

One of the latest uses of wood is the making of paper, although the white hornet showed in its conical paper nest that this could be done. She has been making wooden paper for hundreds of years, scraping the wood from the surface of weathern-worn fence boards, and from the dead limbs of forest trees. Our newspapers are made of ground wood, cooked to a soft pulp, and rolled out into thin sheets. The high price of paper makes it worth while to gather up papers, bleach them, convert them into pulp, and roll them out again into sheets. Spruce wood

and poplar are among the cheap woods which have come into demand at the paper mills. The forests of these trees, counted of little use for lumber, have become valuable because the paper mills can use them.

Look about the room, and a dozen articles, beside the chairs and table, are products of wood, or in some way owe a debt to trees. The paint that covers the window sash and frames was mixed with turpentine, which is obtained from the pitchy sap of pine trees. The shades and curtains are coloured. Dyes of many kinds are extracted from the various dyewoods, trees that grow in tropical forests. The newspaper and the books on the shelves are made of wood pulp. The lacquered box from Japan is a handsome thing. The lacquer varnish is the sap of a certain Oriental sumach tree. The perfume of the gloves in the box is made from the fragrant gum of an Oriental sweet gum tree. The skin out of which the gloves were made was tanned, not with bark, but with the acorn cups, or galls, of a European oak.

The shoes on your feet are made of leather. The hemlock trees that grow on the hills were stripped of their bark by peelers in early spring. Black oak and chestnut oak are also stripped in our woods. Carloads of bark are shipped to the

tanneries to be used in the tanning of skins which changes them into leather.

That beautiful book upon the table is bound in Russia leather. The acorn cups of a European oak were used to tan the skins that made this leather so much more beautiful than that of your shoes. Your gloves are made of kid skins tanned in Europe. For this particular work the nut-like galls that grow on certain oak trees are gathered in the woods.

Tannin is the substance in oak bark which makes it valuable in tanning leather. A high percentage of tannin is found in oak galls. For this reason they are gathered in many countries, and are among the most valuable and high-priced supplies for the establishments that tan skins for gloves. The most expensive inks and dyes, those that do not fade, but are practically permanent, are made from selected oak galls.

Oak apples are a strange fruit, found in more or less abundance on the leaves of our own oak trees in autumn. You have seen them in summer time, plump, green balls, sometimes as large as a hen's egg, but globular, sitting upon a leaf. In autumn the balls take on the colour of the dying leaves.

The same tree may have hard little marble-like balls growing on its twigs. These are of

different sizes, and it is not unusual to find a hole in the side of each.

All such outgrowths on the leaves and twigs of oaks are called galls, and they are chiefly caused by winged insects called gall-gnats. An egg is laid in early spring, in a slit pierced in the twig or leaf. As this egg hatches, the tissue about it is disturbed in its growth by the presence of this feeding grub. The soft leaf pulp, or the tender tissues of the twig that surround it, are exactly what the grub likes to eat. Food and drink are all about it, and as it feeds, it grows. The leaf swells, and so surrounds the grub with an abnormal growth. The grub still feeds, and the swelling becomes larger, until finally, when the insect ceases to eat, it is housed in the peculiar ball which we know as an oak gall. Each species of gall-maker is known by its house.

The oak apples are of several kinds. Some are empty except for a little shell in the centre, in which the fat grub sleeps. Sometimes the substance within the "apple" is corky, sometimes spongy. Bullet galls, which form on twigs like little marbles, are usually solid to the centre, where the grub lies until the time comes for it to bore its way out to the surface, and fly away, to lay eggs which will produce other galls. Usually oak galls, found in winter, contain the sleeping

grub, whose transformation into a winged insect waits until the coming of spring.

The cork in your ink bottle is the bark of an oak tree. Go to Portugal or to Northern Africa, and you may see the cork harvest in progress in July or August. There is no place to go for genuine cork except to a small evergreen oak that rarely reaches a height over thirty feet. When these trees are twenty-five years old, a hard, thin layer of bark is stripped off. This is a valuable tan bark, but it is not in the least corky. The tree now produces a spongy bark entirely different from the first. It is not disturbed for eight or ten years. This is stripped off. It is the poor quality of bark which fishermen use to float their nets with.

Ten years later the bark is stripped again. It is better in quality than the first. Each ten years brings the bark stripper again to the tree. In the fiftieth year, the bark is of the finest quality, and for fifty years that follow there are five strippings of bark of the highest grade. Then the quality becomes poorer. The trees are cut down, the bark is sold to the tanners, and the wood is used for charcoal or for fuel.

It is a very particular job to get the cork off and leave the under layer uninjured. The trunk is stripped from the ground to the point where

it branches, and the inner "mother bark" must not be bruised, for no more cork will grow on any bruised spot. Two circular cuts are made, one at the top, one at the bottom of the columnar trunk, then two opposite slits are made dividing the bark of the trunk into two halves. These curved plates are worked off by inserting a wedged-shaped tool between the bark and the trunk, and gradually working it further in until the whole curved plate of cork comes off. These two big sheets are steamed and flattened, then bound in bundles, and shipped to wholesale dealers in cork.

The owner of a grove of cork oaks must wait ten years between crops of the bark, but every year three crops of acorns are borne on these trees. The pigs of the owner, turned into the grove, fatten on this rich food. So the little trees are very profitable in two ways.

In the south of Europe, the handsome, evergreen holm oak grows wild; its glossy leaves and compact form remind us of our holly trees. It is one of the most valuable ornamental oaks, but as a fruit tree, it has unusual value. Its acorns are sweet and rich, and the crop is heavy. Hogs are fattened upon them. In earlier days they were used as human food, and even now gipsies gather them to eat. Its acorn cups, bark,

and the galls it bears are of the very best quality. They are used in the most particular jobs of dyeing and tanning.

Under ground, the holm oak bears a strange fruit—a fungus called "truffle" develops on the roots. These truffles are somewhat like mushrooms in their growth. They are far more delicious to eat, and expensive to buy than ordinary mushrooms. The best of them are found in France, and French people are especially fond of them.

Trees that grow on chalky lands are more likely to produce truffles. At a dozen years old, they begin to yield, and truffles may be found upon their roots for about twenty-five years.

Not every holm oak has truffles on its roots. The finding of these delicacies is a very interesting and exciting game, and a great deal of a lottery. There is but one way to find them, and that is by the sense of smell. The truffle has a rich, strong odour. Dogs and pigs are the only animals that are able to find it. The truffle-hunter is usually an old woman, who goes with a trained pig or a trained dog into the oak forest. She has a basket, and a spading fork, and she keeps a close eye on her four-footed partner. If the pig, in rooting about under an oak, suddenly becomes excited, and begins to root furiously, she drives him away, and

digs out the precious ball of fungus he has scented. It is irregular in form, and looks somewhat like a potato. Meanwhile the pig locates another, and is again disappointed. The truffle dog is treated in the same manner. Unless put into a pen, or chained at night, these truffle-hunters are likely to take to the woods and feast when no one is by to interfere with their pleasure.

Truffles are shipped in cans to the United States, but we have not yet discovered them growing on the roots of our oak trees. Probably we have not yet looked for them with sufficient care and patience.

APPENDIX

APPENDIX

IDENTIFICATION KEYS TO TREE GROUPS AND FAMILIES

A KEY TO NEEDLE-LEAVED EVERGREENS

A. Leaves few, in sheathed bundles, set spirally on the twig. THE PINES.

AA. Leaves solitary, set spirally on the twig.

B. Twigs with bracket-like projections for attachment of leaves; cones hanging down.

C. Leaves flat, blunt, with short stalks. THE HEMLOCKS.

CC. Leaves angled, sharp, without stalks. THE SPRUCES.

BB. Twigs smooth; cones standing erect. THE FIRS.

A KEY TO THE PINES

A. Sheaths of leaf-bundles soon shed; wood soft, pale. SOFT PINES.

B. Needles, 5 in a bundle.

C. Cones, 5 to 8 inches long; Eastern. WHITE PINE.

CC. Cones, 12 to 18 inches long; Western. SUGAR PINE.

A KEY TO THE PINES—*Continued.*

BB. Needles fewer than 5 in a bundle; Western.
NUT PINES.

AA. Sheaths of leaf-bundles not soon shed; wood hard, heavy, dark, resinous.
HARD PINES.

B. Needles, 3 in a bundle.

C. Length of needles, 8 to 18 inches; cones, 6 to 10 inches.
LONGLEAF PINE.

CC. Length of needles, 6 to 9 inches; cones, 3 to 5 inches.
LOBLOLLY PINE.

CCC. Length of needles, 3 to 5 inches; cones, 1 to 3 inches.
PITCH PINE.

BB. Needles, 2 in a bundle; Northern.

C. Length of needles, 4 to 6 inches; cones, 2 inches. RED PINE.

CC. Length of needles, 1 to 3 inches; cones, 2 to 3 inches. JERSEY PINE.

BBB. Needles, 2 or 3 in a bundle; Southern.

C. Length of needles, 3 to 5 inches; cones, 1 to 3 inches.
SHORTLEAF PINE.

CC. Length of needles, 8 to 12 inches; cones, 3 to 6 inches.
CUBAN PINE.

A KEY TO THE SCALE-LEAVED EVERGREENS

A. Seeds borne in a woody cone; twigs flattened, leaves minute.
ARBOR VITAE. WHITE CEDAR.

AA. Seeds borne in a fleshy, blue berry; leaves scale-like or spiny, or both.
JUNIPER. RED CEDAR.

A KEY TO THE NUT TREES

A. Nuts in a husk that opens when ripe.
  B. Husk opens in four divisions.
    C. Surface of husk, spiny.
      D. Nut three-angled, small, two in a husk. BEECH.
      DD. Nut rounded, or flattened, 2 or 3 in a husk. CHESTNUT.
    CC. Surface of husk not spiny. HICKORIES.
  BB. Husk opens in three divisions. HORSE-CHESTNUTS AND BUCKEYES.
  BBB. Husk opens in two divisions; spiny. CHINQUAPIN.
AA. Nuts in a husk that does not open when ripe.
  B. Shape of nut, globular; surface, smooth. BLACK WALNUT.
  BB. Shape of nut, oblong; surface, clammy. BUTTERNUT.

A KEY TO THE GROUPS OF OAKS

A. Acorns, annual; bark usually pale; leaves with rounded lobes, not spiny-pointed. THE WHITE OAK GROUP.

AA. Acorns, biennial; bark usually dark; leaves with spiny-pointed lobes. THE BLACK OAK GROUP.

A KEY TO THE WHITE OAK GROUP

A. Leaves evergreen; Southern tree. LIVE OAK.

A KEY TO THE WHITE OAK GROUP—*Continued.*

AA. Leaves not evergreen.
B. Lining of leaves pale, not downy; lobes finger-like. WHITE OAK.
BB. Lining of leaves pale, downy.
C. Bark of branches corky-ridged; acorn large, in fringed cup. BUR OAK.
CC. Bark of branches shed in rough flakes; acorns large, on long stalks. SWAMP WHITE OAK.
CCC. Bark of branches not corky-ridged, nor scaly.
D. Acorn medium-sized; leaf margins cut into squarish lobes. POST OAK.
DD. Acorn large; leaf margins wavy; bark dark brown. CHESTNUT OAK.

A KEY TO THE BLACK OAK GROUP

A. Leaves narrow, willow-like; Southern tree. WILLOW OAK.
AA. Leaves oval, with deeply-cleft margins.
B. Acorn cups shallow, broader than high.
C. Tree pyramidal, twigs with pin-like spurs. PIN OAK.
CC. Tree spreading; acorns large, in shallow saucers. RED OAK.
BB. Acorn cups as deep as broad.
C. Leaves thin, smooth, deeply cut; acorn cup drawn in at the top. SCARLET OAK.
CC. Leaves leathery, rough, with rusty hairs beneath; acorn cup not drawn in at the top. BLACK OAK.

A KEY TO THE ELMS

A. Twigs smooth, not hairy-coated.
  B. Bark of branches not corky-ridged.
    AMERICAN ELM.
  BB. Bark of branches corky-ridged.
    WINGED ELM. WAHOO.
AA. Twigs hairy-coated.
  B. Bark of branches corky.
    CORK ELM. ROCK ELM.
  BB. Bark of branches not corky; buds coarsely hairy. SLIPPERY ELM.

A KEY TO THE MAPLES

A. Leaves simple.
  B. Bloom before the leaves open; seeds ripe in May.
    C. Flowers red; leaves pale beneath, with three triangular lobes.
      RED MAPLE.
    CC. Flowers greenish; leaves pale beneath, deeply cleft, with long, spiny lobes. SILVER MAPLE.
  BB. Bloom after the leaves open; seeds ripe in autumn.
    C. Leaves wider than long; lobes spiny-tipped.
      D. Lining of leaves, pale; keys joined at acute angle.
        SUGAR MAPLE.
      DD. Lining of leaves, not pale; keys joined at wide angle.
        NORWAY MAPLE.
    CC. Leaves circular, lobed; tree prostrate.
      VINE MAPLE.

A KEY TO THE MAPLES—*Continued.*

CCC. Leaves about as wide as long; trees small.

D. Bark striped with white lines; flowers and seeds in dense, pendant clusters.

STRIPED MAPLE.

DD. Bark not striped; flowers and seeds in pendant clusters.

MOUNTAIN MAPLE.

AA. Leaves compound, of 3 to 7 leaflets.

ASH-LEAVED MAPLE. BOX ELDER.

A KEY TO THE WILLOWS

A. Twigs long, drooping. WEEPING WILLOW.

AA. Twigs erect.

B. Leaves white beneath.

C. Twigs yellow in spring; leaves narrow.

GOLDEN OSIER WILLOW.

CC. Twigs reddish in spring; leaves broad.

PUSSY WILLOW.

BB. Leaves not white beneath; heart-shaped frill at base of leaf stem.

BLACK WILLOW.

A KEY TO THE LOCUSTS

A. Leaves simple; flowers rosy. REDBUD.

AA. Leaves compound.

B. Trees thorny.

C. Thorns simple, paired, at bases of leaves; pods small, thin.

BLACK LOCUST.

CC. Thorns often branched, clustered; pods large, curved.

HONEY LOCUST.

A KEY TO THE LOCUSTS—*Continued.*

BB. Trees not thorny.

C. Pods thick; limbs clumsy; leaves twice compound.

KENTUCKY COFFEE TREE.

CC. Pods thin, small; limbs not clumsy; leaves once compound.

YELLOW-WOOD. VIRGILIA.

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